THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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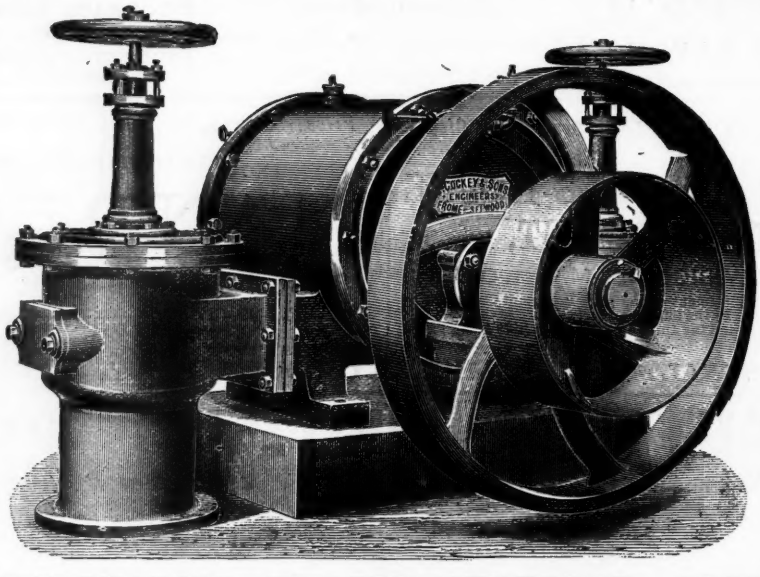

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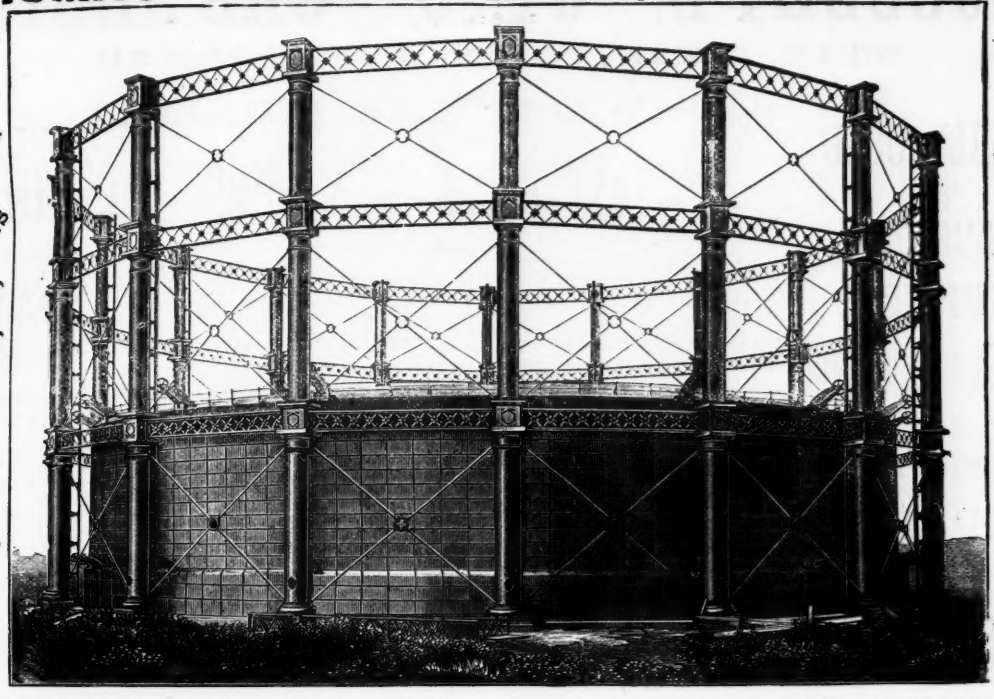

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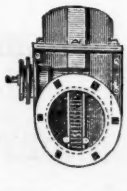

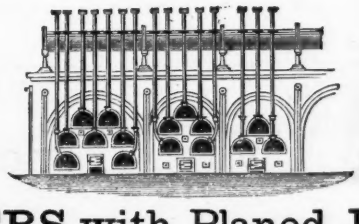

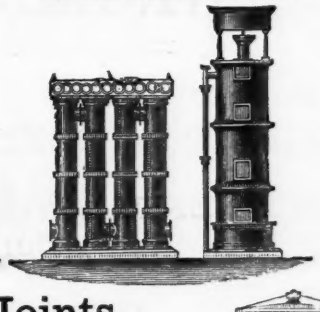

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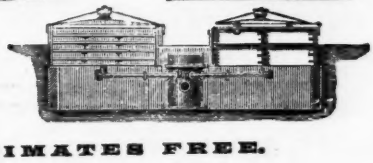

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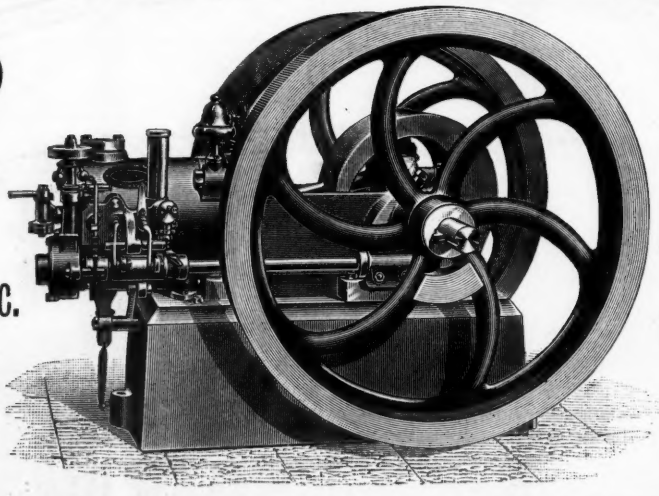

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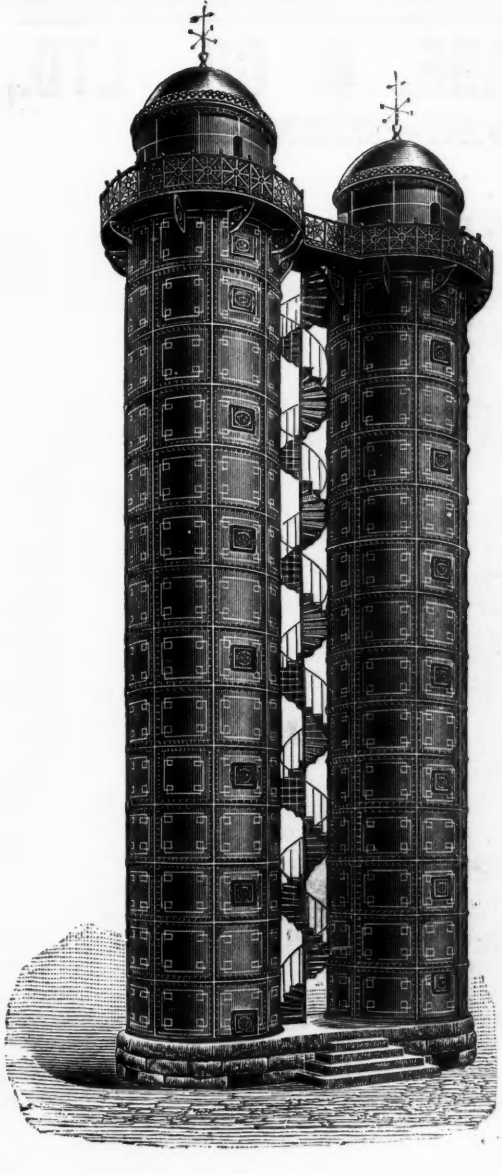

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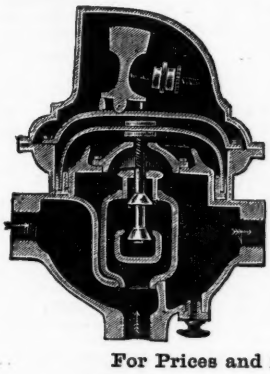

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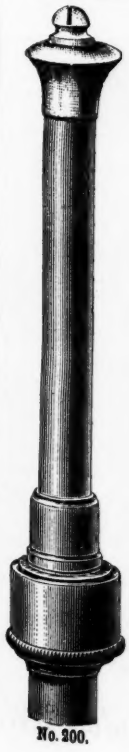

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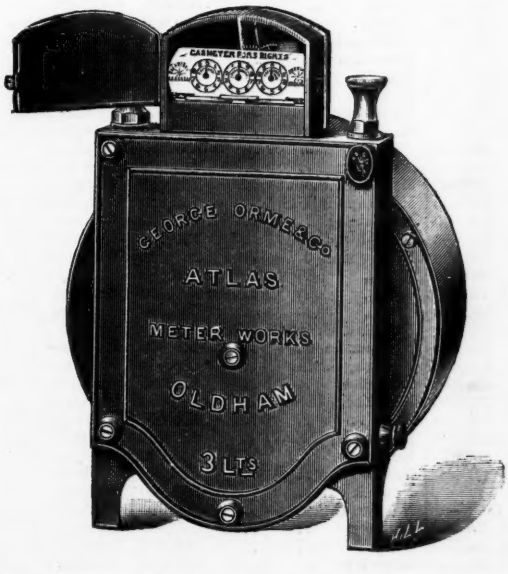
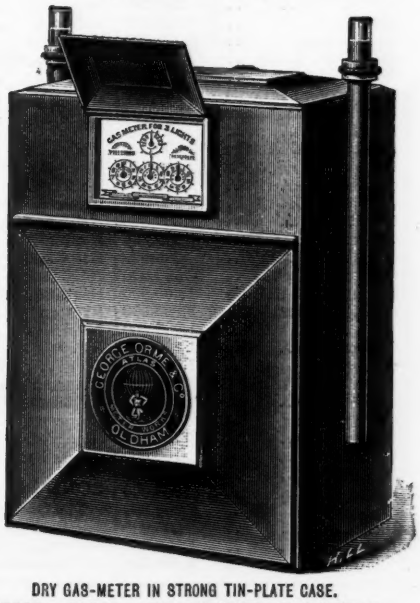


WET GAS-METER IN CAST-IRON CASE.



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Capable of extracting the whole of the Ammonia from 410,680,000 Cubic Feet of Gas per 24 hours.

Erected and in course of construction at present date, amongst them being the following, viz.:—

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Adelaide	600,000
Aldershot	200,000
Allegheny, U.S.A. ..	1,000,000
Ashton-under-Lyne ..	1,250,000
Amsterdam (2) ..	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co.	200,000
Altoona, U.S.A. ..	350,000
Buxton	250,000
Bradford (3)	1,000,000
,, (3)	1,250,000
,, ...	3,000,000
Bremen	150,000
Baltimore, U.S.A. (3)	1,000,000
Balmain, N.S.W. ..	125,000
Bishops Stortford ..	150,000
Blackpool	400,000
Brussels (3)	1,250,000
,, ...	750,000
Banbury	250,000
Birmingham (2) ..	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A. ..	2,000,000
Brisbane	1,500,000
,, ...	300,000
Burton-on-Trent ..	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co. (2) ..	20,000
Bombay	700,000
Buffalo, U.S.A. ..	550,000
,, ..	500,000
Brooklim, U.S.A. ..	300,000
Bergen	250,000
Berlin	150,000
Bournemouth ..	1,000,000
Bridgeport, U.S.A. ..	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A. (2)	1,000,000
Brunner, Mond, & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A. ..	500,000
Cincinnati, U.S.A. (2)	1,500,000
Chicago, U.S.A. ..	3,000,000
,, (2) ..	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas-Works Co.	100,000
Cadiz	300,000
Charlottenberg ..	600,000
Dudley	750,000
Driffield	100,000
Dukinfield	500,000
Dover	750,000
,, (2)	1,000,000
Deal	200,000
Derby 2)	1,500,000
,, ...	1,000,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A. ..	350,000
Denver, ,, ...	500,000
,, ,, ...	1,000,000
Düsselldorf	750,000
,, ...	500,000
Dumfries	250,000
Dunedin, N.Z. ..	400,000
Darlington	1,250,000
Detroit, U.S.A. ..	750,000
Edinburgh	1,500,000
,, ...	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte ..	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W. ..	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba ..	750,000
Hastings	1,500,000
Huddersfield	300,000
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Ilkeston	300,000
Inverness	250,000
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Ilford	100,000
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Kidderminster ..	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000

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The Gaslight and Coke Co. :—

Beckton (6) ..	1,250,000
,, (2) ..	2,500,000
Silvertown ..	1,000,000

	Capacity. Cubic feet per day.
LONDON—*Continued.*	
The Gaslight and Coke Co. :—	
Bromley (2) ..	2,000,000
,, (4) ..	1,500,000
Shoreditch ..	2,500,000
Pancras (2) ..	1,500,000
Pimlico	2,000,000
Nine Elms (2) ..	3,000,000
Kensal Green (2)	3,000,000
South Metropolitan Co. :—	
Greenwich ..	3,000,000
Woolwich ..	400,000
Vauxhall (2) ..	3,000,000
Lea Bridge ..	300,000
West Ham	1,500,000
,, ...	3,000,000
Leeds (2)	2,000,000
,, (4)	3,000,000
Leominster	150,000
Leiden	560,000
,, ...	600,000
Liverpool (5)	2,000,000
,, (4)	3,000,000
Lincoln	1,000,000
,, ...	600,000
Lowell, U.S.A. ..	1,000,000
Laclede, ,, ..	1,000,000
Louisville, ,, ..	1,500,000
Long Eaton	500,000
Lille	900,000
,, ...	450,000
,, ...	750,000
,, (2)	250,000
Luckenwalde ..	330,000
Liegwitz	300,000
Lincoln, U.S.A. ..	250,000
Lawrence, ,, ..	500,000
Lynn, ,, ..	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles (2) ..	1,500,000
Mons	500,000
Malines	250,000
Melbourne (5) ..	1,500,000
Manchester (2) ..	2,500,000
,, ...	400,000
Middleton	400,000
Manley, N.S.W. ..	100,000
Minneapolis, U.S.A. ..	750,000
Magdeburg	300,000
Memphis, U.S.A. ..	750,000
Nottingham	1,250,000
,, (2) ..	2,500,000
,, (2) ..	2,000,000
,, ...	1,500,000
Newport, U.S.A. ..	430,000
Newmarket	150,000
Newark, U.S.A. ..	680,000
Northfleet	200,000
New York, U.S.A. ..	2,000,000
Nice	600,000
Newcastle, N.S.W. ..	200,000
Numea, ,, ..	100,000
Namur	250,000
Newark	350,000
Nassau, U.S.A. ..	1,000,000
Oldbury	500,000
Otley	200,000
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Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
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Prescot	150,000
Providence, U.S.A. (2)	750,000
Plauen (2)	300,000
Portsmouth (2) ..	2,500,000
Pittsburg, U.S.A. ..	1,500,000
Portland, ,, ..	560,000
Pawtucket, ,, ..	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A. ..	250,000
Roxbury, ,, ..	500,000
Runcorn Soap Co. ..	20,000
Rockhampton, N.S.W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach ..	200,000
Smethwick	750,000
Sydney, N.S.W. (2) ..	1,000,000
,, ..	2,500,000
Sunderland	1,500,000
St Joseph's, U.S.A. ..	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg ..	2,000,000
,, ..	1,500,000
St. Louis, U.S.A. (2)	2,000,000
,, ..	1,000,000
Silesian Coal Co. ..	600,000
San Francisco, U.S.A. (2)	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A. ..	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich (2) ..	1,000,000
Willenhall	250,000
Weston-super-Mare ..	500,000
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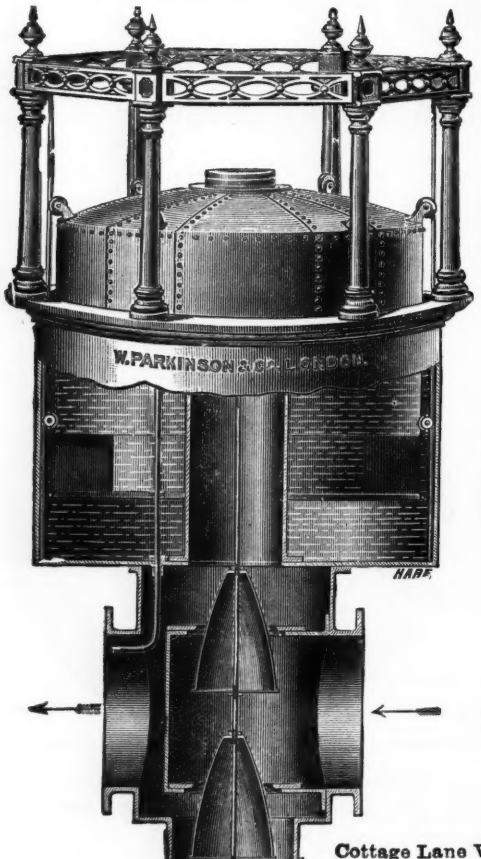

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[See also Advt p. 225.

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ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but Orders for Alterations in or Stoppages of PERMANENT ADVERTISEMENTS should be received Not Later than the FIRST POST on SATURDAY.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, FEBRUARY 2, 1892.

The Report and Accounts of The Gaslight and Coke Company.

THE report of the Directors and the accounts relating to the last half-year's working of The Gaslight and Coke Company have been issued, and will be found in another column. The general meeting of the Company will be held, as announced, on Friday next. According to the report, the operations of the Company for the past half year have resulted in the provision of a balance of profit amounting to £206,876 after satisfying all fixed charges; and this sum is applicable to paying a dividend on the ordinary stock. The selling price of gas during the half year having been 2s. 9d. per 1000 cubic feet, or 1s. per 1000 cubic feet below the statutory initial price under the sliding scale, the legally-permissible rate of dividend would be 13 per cent. But to pay this full rate of dividend, it would be necessary to take £148,727 out of the reserve fund. The Directors are unable to see their way to such a heavy dip into the reserve; and they therefore recommend that the dividend should be after the rate of 12 per cent. instead of 13 per cent. This will require £121,372 to be withdrawn from the reserve fund; leaving a balance of £115,244 to its credit.

"In view of the continued deficiency in profit required "to meet the authorized dividend involving the absorp- "tion of so large a portion of the reserve fund," the price of gas has been raised. The Directors explain that "this "step is taken in the belief that it is necessary to main- "tain the margin of profit required to pay the statutory "dividend without, if possible, further trenching upon the "reserve fund." What "sweet simplicity" there is in this way of dealing with a non-paying business! The report then goes on to state that the abnormal increase of gas consumption during the winter of 1890-91 was followed in the last half year by an actual decrease of 1·74 per cent.; while the mild weather of the early winter, and other causes, led to a bad sale for coke and other residuals. It is, however, carefully pointed out that, by taking the two halves of the year together, the absolute increase of gas sales averages 3·76 per cent.; the mean over the past twelve years having been 3·43 per cent. The report admits a reduction in the cost of coal, but accuses its quality and condition of being inferior, which, of course, is very deplorable. The inveterate fancy of the Chartered Board for big figures finds expression in the statement of the report respecting the demand for gas during Christmas week. The undecided assessment appeals are curtly mentioned; and the report concludes with a reference to the Standards of Light Committee, and a paragraph designed to take the place of the officers' reports regarding the state of the Company's manufacturing and distributing plants, which have been a feature of these half-yearly reports for a long time past.

The revenue account credits the Company for gas sold during the half year with the sum of £1,299,026, as against £1,309,802 for the corresponding half of 1890, when the price was the same. Residuals show a more serious drop, from £466,227 to £404,476. Altogether, there was a falling off of revenue from £1,813,995 to £1,744,462, or a decrease of £69,533. On the other side, the working expenses have likewise been diminished, from £1,442,445 to £1,351,160. It is noteworthy, therefore, that the management has not merely held its own in face of narrower means, but has actually improved the gross balance from £371,550 to £393,301, for which unstinted praise must be given. The decreased cost of working was as much as £91,285, which is derived as follows: Coal cost £722,757, as against £788,990; salaries of Engineers and works' officers were slightly cut (those in the Secretary's Department being meanwhile increased); wages fell from £180,825 to £172,076; purification was cheapened from £41,802 to £38,482; and repairs came to £160,591 instead of £178,727. Thus gas manufacturing charges stand for £1,103,787, as compared with a sum of £1,200,453, or a drop of £96,666. This is where the saving has been effected; other entries pointing in a different direction. Let us now see how the figures look in respect to work done. There were 973,949 tons of coal carbonized, and, in addition thereto, oil equivalent to 14,631 tons of cannel was employed. The use of this oil (some of which was probably heavy oil put into the retorts, some gasified in a water-gas cupola, and some merely vaporized as spirit) rather complicates the calculation; but, taking coal and oil together, the carbonizing returns work out to a make of 10,321 cubic feet per ton—leaving 4·45 per cent. of the output unaccounted for. Still regarding the oil as cannel, the coal carbonized cost 15s. 11·52d. per ton; and the labour for carbonizing the coal only (not reckoning the oil this time, for obvious reasons) works out to 3s. 6·24d. Six months ago we found that the coal carbonized cost 16s. 4·72d. per ton; and carbonizing wages were practically the same as now.

Much might be advanced in regard to the foregoing details of the Company's operations; but we prefer to revert for the present occasion to the broad facts of the

Company's position. Exactly twelve months ago, the Governor (Colonel Makins, M.P.) told the proprietors that, while it was probable that the reserve fund, which, after the declaration of the dividend then recommended, would stand at £385,700, might be still further reduced, "he did "not expect to see it fall below £250,000." Well, it is to be reduced to £115,234; and, in order to save this comparatively small balance from disappearing altogether during the current half year, the Directors have had to take the heroic step of increasing the price of gas to 3s. 1d. per 1000 cubic feet. If they were alone in London, or in the country, there would not exist any means of comparison, through observation of which it might be possible for outsiders to judge of the amount of justification for such a course. It so happens, however, that these means of comparison do exist; and the Horseferry Road authorities are likely to hear a good deal about them before their part of London will be resigned to pay for the dearest gas in the capital, merely in order that a gas-works administration, whether capable or not, may be sure of as wide a margin of profit as they think proper.

Appointment of a Secretary by the Standards of Light Committee.

THE Standards of Light Committee did a good stroke of business on Thursday in appointing Professor Vivian B. Lewes to be their Secretary. It is obvious that a very great deal of responsibility for making the result of the deliberations of such a heterogeneous body really useful must of necessity rest with the Secretary; and, without saying anything depreciatory of other qualified gentlemen who might be named as fit for the post in question, we do not fear contradiction when we say that Professor Lewes is one of the best of the contemporary specialists upon whom the choice of the Committee might have fallen. It was hinted of the last Board of Trade Committee on the Standards of Light that rather more than the due share of responsibility for the result was attachable to the Secretary; but in all Professor Lewes's published work, we do not recall any expression of opinion bearing upon the matters now before the Committee which stamp the author as a partizan of candles, pentane, amyl-acetate, or anything else. He is, moreover, a most industrious worker; and the fact that he has the business in hand is a sufficient guarantee that every point brought before the Committee will be thoroughly dealt with. While mentioning the work of the Committee, it may be noticed that the electricians are taking a serious interest in this inquiry, which they perceive may have important results for the electric lighting industry. They appear to desire the retention of the candle unit as the standard measure of artificial light; but are indifferent as to whether the statutory representation of this measure is the equivalent of one candle or of a multiple of the candle. They do not give up the hope of producing an electrical standard of light; but they admit that, so far as can be seen, too many elements would have to be standardized to render the production of a reliable incandescent standard lamp an easy or even a practicable matter. It is quite possible that some steps may be taken, by representatives of elecrtic lighting interests, to convey a statement of their views on the subject to the Committee. There is nothing very definite about these views at present; but if the electricians have only to say that, in the settlement of the bases of photometrical practice, they desire the special requirements of the photometry of electric lamps to be considered, it will be as well for this request to be formally put upon the record.

A Point of Law Reform.

THE position which we have long occupied respecting the scandalous waste of money and time in connection with the trial of patent cases has recently been strengthened by comments from the Bench and admissions from the Bar. Mr. Justice Romer had to try a couple of consolidated actions bearing upon patented machinery used in the manufacture of wood screws; and, of course, the usual strings of Counsel appeared for the parties, who also paraded the inevitable array of "experts." Fourteen days were taken up in hearing these learned gentlemen solemnly contradict each other; and, in the end, the Judge told the Counsel, in almost as many words, that they ought to be ashamed of themselves for their conduct of the matter. The Attorney-General very handsomely admitted the reasonableness of the Judge's censure, and as good as promised that he and his colleagues would try and behave better in future. But Sir Richard Webster, who is nothing if not bluff, candid, and hearty, suggested that in reality it is not the lawyers who are to blame for the scandalous costliness and over-elaboration of these essentially trumpery patent cases. It is all the fault, says this authority, of the scientific witnesses, the experts, particularly when these happen to be "professors." These gentlemen insist upon lecturing before the Court, and spin out their evidence upon immaterial points of detail beyond anything that the law requires. This is naturally particularly distressing to the legal gentlemen, who are not under any similar temptation to give the case every possible "squeeze" that the pockets of their clients can be supposed to be capable of bearing! Before, however, one can absolve the latter of all complicity in creating and fostering the abuse so strongly condemned by Mr. Justice Romer, it is necessary to inquire who is responsible for getting up these cases. How is it that, before a manufacturer of screws, or gas-lamps, or any other patented specialty, can bring the most obvious of infringers to book, he must not only retain the Attorney-Gentral and three or four other "leaders" in this class of business, but must also engage half-a-dozen recognized "experts," whose names will occur at once to the minds of our readers, and who may know no more about the business in hand than the Man in the Moon? It matters not whether the subject of the dispute be telephones, ships' anchors, wood screws, or gas-lanterns, the same "experts" are laid on, at enormous expense. The practice has attained such a pitch that the mystic initials F.R.S. might in some instances bear the interpretation of Follower of Remunerative Science instead of that which is ordinarily attached to them. The existing usage in regard to the presentment of patent cases before the Court is, in short, a grave scandal; and it is to be hoped that the observations of Mr. Justice Romer upon this head will bear good fruit.

The Labour Commission.

THE Mining and the Shipping and Transport Sections of the Labour Commission sat for several days last week; and some important evidence was given with regard to the condition of miners, seamen, and dock labourers, and the character and operations of the various associations of employers and Trades Unions connected with these industries. We notice that some of the daily newspapers have begun to complain of the proceedings of the Commission as being "uninteresting." This is only what might naturally have been expected. The average newspaper reporter and editor soon find the transactions of a public body dull, if they are not freely sprinkled with "startling "disclosures," personal "scenes," and similar good things for the posters. It does not seem to have occurred to these critics that the Commission was not really appointed with the object of providing exciting reading for purchasers of halfpenny evening newspapers, or that evidence which the caterers for the public that likes "spicy news" despise as dull, may be in reality the best possible justification for the existence of the Commission. It is becoming increasingly evident, as time goes on, that the proceedings of the Commission are not likely to advance the cause of the New Unionism, or to favour the views of those sentimental dabblers in so-called Labour Politics of whom the late Cardinal Manning was the type, and whose general idea was that employers are all bad together, and invariably in the wrong in all disputes with their work-people. Naturally, there is a good deal of assertion and counter-assertion before the Commission by witnesses for different interests; but the burning abuses which bulk so largely in the orations of mass-meeting speakers appear very dead in the quiet air of the Commission-room. The obligation to support statements by figures and other verifiable data is fatal to the agitator, who is now learning that the atmosphere of his favourite "house of call," whence he has been in the habit of issuing his "strike manifestoes," is better for him than that of Westminster Hall. Last Thursday's proceedings were particularly instructive; two different accounts of the Southampton Dock strike of September, 1890, being given by a local employer, Honorary Secretary of the Free Labour Association, and Tom M'Carthy, who figured so prominently as an "organizer" in connection with this affair, which resulted disastrously for the men, and was accordingly repudiated by the Dockers' Union. There

was also something said on Friday by a Barking clergyman, who has officiated as head of a local branch of the Dockers' Union, about the astonishing amount of money which the down-trodden victims of the Dock Directors, for whom Messrs. Mann and Tillett plead so piteously, squander for drink. Unfortunately, in the necessary condensation which the transactions of the Commission receive for newspaper purposes, so much matter is cut out, that it is desirable to read several such abstracts every day in order to glean a reliable idea of what the Commissioners are doing. The worst of it is, moreover, that this process of condensation is hardly distinguishable sometimes from garbling the matter; so that those newspapers which follow the cue of truckling to the Trade Union leaders are able to suppress evidence uncomplimentary to the latter, without appearing to act from other motives than those which operate, in a general way, to prevent full reports of the proceedings of the Commission from filling the Daily Press.

A Curious Suspicion.

Almost anything bearing upon the subject of the influenza is regarded by newspaper editors as good matter at the present time; but recently a London daily paper which specially prides itself upon the immensity of its circulation, gave publicity to a suggestion which deserves to be called amazing. This was, that the prevalence of the epidemic in question might possibly be explained by reference to the modern introduction of high-pressure electrical distribution systems, which are to be suspected of so disturbing, by induction, the usual balance of atmospheric influences, as to create an opening for the development and spread of this specific infection. The fact that such a suggestion has been made is, at any rate, an indication that no sooner does the electric lighting industry lose the protective charm of novelty, than it inherits all sorts of popular suspicions of the same character as, if differing in kind from, those which have long attached to gas. When the electricians first essayed to enter the domain of public and private lighting, in which gas had previously been supreme, they doubtless thought it a favourable circumstance that they were welcomed with enthusiasm by a noisy host of malcontents, some of whom had to allege that gas lighting is unhealthy, while others cherished an invincible scepticism regarding the trustworthiness of gas-meters. All these cranky sanitarians and domestic economists in their various degrees hailed electricity as their means of deliverance from the injuries which they suspected to flow from the use of gas for lighting purposes, simply because they were so accustomed to it, and its employment was so general. And all the malcontents were sympathetically received by the prophets of the new order, who promised undimmed satisfaction to all and sundry who would abandon the poisonous, inefficient, and fraudulent gas for their pure and flawless illuminant. Alas! the community has had some experience of electric lighting; and still the "quidnuncs" are not happy. They accuse electricity of even more fantastic crimes against the public health and the public pocket than gas was ever reproached with; and the electricians learn, by painful experience, that the favours of grumblers against an established industry constitute but an insecure foundation for the creation of a new one. These observations are not very complimentary to the sense of the community; but they are true. Electricians will probably live to perceive with gas managers, if they do not yet understand the matter, that one of the disadvantages of a free Press is the absurdly disproportionate importance which newspaper correspondence and commentary confer upon malcontents of all kinds, comparison with the mute majority which does not take the trouble to express its satisfaction with existing arrangements.

The Board of the Croydon Gas Company.—Mr. Pelton has been elected a Director of the Croydon Gas Company, in place of the late Mr. Charles Newton. It has been already mentioned that the deceased gentleman is succeeded in the chairmanship by Mr. W. Hyslop, formerly the Deputy-Chairman.

Mr. James Madge.—It is with much regret that we have to record the death of Mr. James Madge, who was the respected Secretary of the West Ham Gas Company from June, 1866, to June, 1889, when he retired through failing health. For many years previous to 1866, the deceased gentleman was Manager of Messrs. Tucker's silk-works at West Ham Abbey. Mr. Madge died last Tuesday at Brixton; and the interment took place at the West Ham Cemetery on Saturday.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 215.)

Another dull week, and business seemed not to have much life in it. Prices were not dashed down, but were in a drooping mood generally. After the settlement, the tone was somewhat improved; but the markets remained very quiet. The Money Market is much firmer than it was; the demand having greatly improved. Business in Gas has been moderate; and the tendency was, on the whole, very favourable. Gaslight "A" was in good favour, and advanced 3. The opening price on Monday was 218; and the closing bargain marked on Saturday was 223. The report and accounts of the Company were in general circulation on Friday; and, if the course of prices is any guide, the market seemed to like them. They are fully discussed in another column. The report appears to have been drawn with less than the usual care and skill; and some portion of it strikes us as decidedly injudicious. By a curious slip of the pen, too, the lowering of the dividend from 13 to 12 per cent. is termed a reduction in the "standard" rate of dividend. The standard rate is, of course, 10 per cent.; the 13 per cent. is the "statutory" or "authorized" rate. As for the accounts, they are, barring the reduced quantity of gas sold, about as good as could be expected. South Metropolitans have been active and firm. The buying prices of the "A" and "C" advanced 5 each; and business was done in the former at 275, and in the latter at 239. The Company invites applications for "C" stock at 240 net, free of charge. This is quite as good as buying in the market at 239; and the indefeasible title thus acquired from the Company may be worth something more to those who are haunted by the bogey of forged transfers. Commercials were more frequently dealt in than of late; but prices were not remarkable. The Suburban and Provincial undertakings were almost entirely neglected; and the only change in quotation was a rise of 1 in British. The Continental Companies were irregular. Imperial receded 1; but afterwards remained very steady at 225. Continental Union recovered half its loss of the week before; and European was quoted at an advance *ex div.* Among all the rest of the Foreign division, nothing moved but Buenos Ayres, the shares of which relapsed ½, while the quotation of the bonds was drawn in closer. Water shows a renewed disposition towards weakness; and Chelsea, East London, and Southwark have also receded in price.

The daily operations were: At the opening on Monday, business was steady, remaining rather quiet all day. Continental Union rose 2½. Business continued about the same on Tuesday, with a good tendency generally. Gaslight "A" rose 2; and Buenos Ayres debentures 1½. But Imperial Continental fell 1. In Water, Chelsea and East London fell 2 each. On Wednesday there was rather more activity, coupled with firmness. Gaslight "A" rose 1 more; but Buenos Ayres lost the rise of the preceding day. Chelsea and Southwark Water dropped 2 each. Prices throughout held up well on Thursday; the only move being a fall of ½ in Buenos Ayres shares. Friday's business was quiet and without special feature. Saturday was rather more animated than usual; and the tendency was favourable. South Metropolitan "A" and "C" rose 2½; and British, 1.

ELECTRIC LIGHTING MEMORANDA.

The Affairs of the St. James's and Pall Mall Electric Light Company—Professor Ayrton on Electrotechnics—The State of the Electrical Exhibition at the Crystal Palace.

The annual general meeting of the St. James's and Pall Mall Electric Light Company has been held; and one or two interesting points are to be noted in the condition of the undertaking, as revealed by the statutory accounts and disclosed by the proceedings at the meeting. It must never be forgotten that this is the *ne plus ultra* of central station electric light companies; enjoying full possession of perhaps the best district in the world for incandescent lighting—a district, moreover, not exceeding 0·26 of a square mile in area. The circumstances of the Company must therefore be understood as being extremely favourable for the low-pressure, three-wire system of distribution employed. So well is this fact appreciated by the public, that the last issue of 7 per cent. preference shares of the Company was taken up at a premium of 30s. per £5 share. The nominal capital of the concern at present stands at £200,000, or after the rate of nearly £800,000 per square mile of the statutory district. The net earnings of the Company for the past year amounted to £10,395, of which £7100 has been distributed as dividends. The actual sum on which dividends were paid was £155,000. A second station has been found necessary, which means, in a sense, a further absorption of capital unproductively. It may be doubted, therefore, whether the Company are ever likely to stand in a better position than they occupied last year. This being the case, it is hardly surprising that some of the shareholders severely criticized the statement put forward by the Directors. Dissatisfaction exists upon two grounds—financial and commercial. The subject of founders' shares is a very sore one

among the St. James's proprietary; as well it may be, seeing that while these shares stand at £100 in the capital account, the holders took last year a dividend amounting to £1075. Then the cost of the stations and the rate of allowance for depreciation are also causes of uneasiness in the minds of many shareholders, who seem to more than suspect the existence in the undertaking of a "secret" that may eventually transpire with disastrous results to the ordinary proprietary, after the founders and others, who hold the wires in their hands, have utilized the present appearance of prosperity for quietly realizing their interest at the top market prices.

The annual meeting of the Institution of Electrical Engineers was held on Thursday last, when Professor W. E. Ayrton, the President for the ensuing year, delivered an Inaugural Address, the theme of which was the training of the young electrical engineer. Nobody is better qualified to expatiate upon this subject than the deservedly eminent head of the City training establishment. In an otherwise appreciative notice of the address, the *Standard* of Friday last, however, seems to think that the eminent Professor, while justified in much that he said, could not altogether resist the temptation to raise the old chorus: "There's nothing like leather!" We are always hearing, from one quarter or another, glorifications of the cause of technical education; and those who are professionally occupied in this work can hardly be expected to realize the position of the outsiders, not otherwise devoid of intelligence, who already entertain doubts as to the real good of it all. Professor Ayrton is naturally one of those who hold that the means of technical instruction provided in this country fall very far short of the reasonable requirements of the teachers and their pupils; but there are two sides to every question, even when, as in this instance, it happens to be a "fad" of the day. It is perfectly reasonable to urge that young people engaged in various industries should be enabled to learn all that is necessary and helpful to the easy and successful prosecution of their occupation; but how shall we guard against the abuse of such means of instruction by aspirants who are not wanted in these industries? It is one thing to make the technical school the appendage of the workshop, and quite another to convert it into a substitute for the latter, as a "genteel" way of picking up the rudiments of a trade. Herein lies the weakness of technical colleges and schools—that they attract neophytes for whom there is no proper after-employment. The condition of the electrical trades is proof of the truth of this objection.

A very great deal yet remains to be done by many exhibitors before the Crystal Palace Electrical Exhibition can be described as fit for inspection. This is a deplorable state of things; and we cannot but think that the success of the undertaking, as a whole, will be prejudicially affected by the culpable unreadiness of so many of those who have been admitted to take part in it. The more practice the frequent holding of exhibitions affords to exhibitors, the more dilatory they appear to grow in getting their stands in order. In the present case, if the exhibition had been an independent venture, with special buildings devoted to it, and held on a site to which the public would need to be specially attracted, it would stand already a confessed failure. Even as it is, unless the public can be induced to take very much more interest in the show than they have done up to the present, there is reason to fear that the Crystal Palace authorities will have cause to regret having given up so much of the building to illustrate the unbusinesslike ways of the electricians and their allies. All last week the Palace was comparatively a desert—ordinary visitors being driven away by the incessant hammering and other noises incidental to a belated industrial exhibition; while of special visitors interested in the application of electricity supposed to be illustrated in the Palace, there were few or none. This means a considerable loss and a great annoyance to those exhibitors whose stalls are ready; for every technical journal joins with us in the cry of warning to all and sundry to keep away from Sydenham for awhile. A good deal of extra lighting has been started during the past few days; but much of it is very unsatisfactory, the occasional extinctions and continual pulsations noticeable in different parts of the show being anything but a recommendation of the systems employed. The exhibition is a real godsend to the newly-started Crystal Palace District Electric Light Company, whose plant is reported to be so fully occupied in the supply of exhibitors, that private customers will be unable to obtain current before the close of the exhibition. Well, the supposititious "private customers" will probably display exemplary patience in waiting; and the Company had better make the best of their present opportunity, for they will find nothing like it afterwards. The Crystal Palace District Gas Company are very busy too; so that both interests have ample cause to be satisfied with things as they are.

Professor Vivian B. Lewes, F.I.C, F.C.S., of the Royal Naval College, Greenwich, has been appointed Secretary of the recently-formed Committee for investigating the standards of light. Professor Lewes's qualifications for this position will, we think, fully justify his selection for it. He has not only had practical experience as a gas examiner, but is at present, and has for some time been, engaged in investigating the light-giving properties of flame, and the nature of combustible gases.

GAS ANALYSIS.*

This work is an important contribution to the subject of gas analysis. It is something more than a mere compilation of methods, or description of apparatus of various kinds. Not only are the details of actual working described with scrupulous care, but in several places comparisons between different methods of effecting the same purpose will be found, enabling the reader to judge for himself as to the degree of accuracy that may be expected to be attained by any one of the plans described. While in no sense an elementary manual of the text-book class, the descriptions are so clear and concise as to render the work a great help to those who have no special chemical knowledge; though it will probably be better appreciated by readers who have had some practical experience in the difficult and tedious work of obtaining accurate determinations as to the composition of gaseous mixtures—such as coal gas, generator gas, chimney gases, &c. In the preface, the author disclaims any intention of preparing a manual of gas analysis. His object is to describe the construction of apparatus and details of operations included in ten years' experience and work upon various gases, actually carried out in his own laboratory, chiefly with the forms of burettes and pipettes designed by himself. Without any attempt at a complete description of all the known methods, particulars of other forms of apparatus have been introduced. By this course, he has produced a wholesome corrective to the somewhat widespread notion that, by means of Hempel's or other similar apparatus, analyses of gaseous mixtures may be effected with little expenditure of time, by persons possessing no skill or experience in analytical operations, giving results sufficiently accurate for all practical purposes, if not scientifically correct. When referring to rapid and simple processes, the author is careful to give a clear idea of the approach towards accuracy that may be expected; thus dealing with a most important item, for the doctrine of "sufficiently accurate" is capable of being expanded to cover operations that are worse than useless. When the "sufficiently accurate" researches give results that are erroneous and misleading, then the last state is worse than the first; so that, when a departure from strict accuracy is permitted—on the ground of economy in time or cost of apparatus—the operator should take special care to know exactly where he stands, and the extent to which his results may be relied upon.

The translator (who may be congratulated upon the clear and precise manner in which he has reproduced the meaning of the author) also gives a short preface, in the course of which he points out that the chapter on the heating power of fuel has been largely re-written, and new illustrations showing the latest forms of apparatus have been substituted for those in the original. The chapter upon the analysis of illuminating gas has been somewhat re-arranged, and a new method for the determination of hydrocarbons inserted. In other respects, the work has been brought up to date; and these alterations have either been suggested or approved by the author.

The work is divided into three parts. The first deals with general methods; the second, with special methods; and the third, with the practical application of gas analysis. The first chapter treats of the precautions necessary in collecting and preserving samples; and the next describes the various forms of Hempel's burettes and pipettes, with complete instructions for their use. In the third chapter, an advancement is made to the apparatus necessary for exact work. After this, there is a description of the arrangement and fittings of a laboratory, an account of methods for purifying mercury, and some details of several forms of absorbing tubes. The second part includes practical considerations—the difference between operations conducted over water or over mercury; the running down of liquids in a burette; the solubility of gases in the absorbents used; calculation of results from combustions; oxygen and hydrogen generators; batteries and coils for producing the electric sparks, &c.; the proportions of gases and other details necessary to secure complete combustion; and the absorbing power of various solutions. The concluding chapter of this part gives details of methods for determining all the gases usually met with in industrial operations—oxygen, ozone, nitrogen, hydrogen, nitrogen and carbon oxides, ammonia, hydrocarbons, cyanogen, hydrogen sulphide, &c. Amongst the "practical applications" are furnace gases, illuminating gas, sulphuric acid works gases, air, and the determination of carbon and oxygen with the simultaneous volumetrical determination of nitrogen in the elementary analysis of organic substances. The last chapter treats of a calorimeter for determining the heating power of coal, coke, and other fuels.

Several points may be specially recommended to those engaged in gas-works laboratories—for instance, the precautions necessary for securing a proper sample of furnace gases; the excellent description of experiments on the best methods of

* "Methods of Gas Analysis." By Dr. Walther Hempel, Professor of Chemistry in the Dresden Polytechnicum. Translated from the second German edition by L. M. Dennis, Assistant Professor of Analytical Chemistry in Cornell University. London: Macmillan and Co.; 1892.

dealing with the residue remaining after absorbing as many constituents as possible from coal gas; and the effect of various absorbents on constituents other than those they are expected to remove. It has been generally supposed, according to the researches of Mr. Lewis T. Wright and others, that the "residue" from coal gas contains other members of the paraffin series in addition to methane. The author, however, has made experiments upon this question, and concludes that "there is no appreciable amount of ethane present with the methane." It should be noted that he absorbs "hydrocarbon vapours" by means of alcohol; and perhaps this explains the discrepancy. Several analyses of samples of coal gas are included in this part of the work.

The details of methods of obtaining specific gravities of gases appear somewhat meagre; and the absence of any reference to several simple methods that are generally known and practised in England is noticeable. For example, the author does not appear to be aware of the existence of Wanklyn's bottles, or the Referees' ammonia and sulphur apparatus. This is the more striking because the numerous precautions shown to be necessary in proceeding by means of absorption or of combustion furnish striking evidence in favour of determining a constituent by precipitation and weighing, in all cases where such is practicable.

Death of Dr. A. Carpenter.—The ranks of sanitary reformers have just lost a prominent figure by the death, last Wednesday, at Ventnor, in his 67th year, of Dr. Alfred Carpenter. After completing his medical studies, he commenced practice at Croydon in 1852; and with that town his name will always be closely identified—having been a member of the Board of Health since 1859, and for many years a Justice of the Peace for Surrey. Among his many works on sanitary subjects are "Hints on House Drainage," "The First Principles of Sanitary Works," and the "Physiological and Mechanical Aspect of Sewage Irrigation." He was a member of the Council of the Sanitary Institute, and was one of the founders of the Smoke Abatement Institution. His keen interest in the object aimed at by the latter body was displayed, only a few weeks before his death, in a letter in *The Times* on the subject of London fogs, the correspondence on which was dealt with in an article in the JOURNAL for the 12th ult. (p. 63).

A Suggestion for The Gas Institute.—In the course of a long letter on the subject of the advisability of gas companies supplying a cheap gas of low illuminating power, suitable for heating purposes, in place of the present 16-candle quality, a correspondent says he considers this might be done to much advantage if the gas could be utilized for lighting by the aid of a thoroughly satisfactory burner of the incandescent type. In this connection he throws out the following suggestion: "Here an opportunity is afforded for the Incorporated Gas Institute to show that it has been incorporated to some purpose. Why does it not offer a certain sum of money for the best burner, capable of being used for lighting purposes with water gas, forwarded to them by a given date; at the same time promising to the successful inventor a definite proportion of the profits made by the sale of his invention, should they place it upon the market? Why not appoint a Committee from among its own members, to make a thorough investigation into the whole question; calling in, if necessary, the aid of a practical chemist, acquainted with gas matters, to aid them in their researches? Surely, from an Institute of this kind, a Committee could be selected who would work at it without payment, and for the good of the gas industry."

Society of Engineers.—At the first ordinary meeting of this Society for the present session, held last night at the Town Hall, Westminster, the retiring President (Mr. W. N. Colam) presented the following premiums of books awarded for papers read during his year of office: The President's Premium to Mr. G. M. Lawford, for his paper on "The Drainage of Town Houses;" the Bessemer Premium to Mr. J. H. Paul, for his paper on "Corrosion in Steam-Boilers;" and a Society's Premium to Mr. J. Kerr, for his paper on "Portable and Pioneer Railways." He then introduced his successor in the presidency (Mr. J. W. Wilson, jun.), who delivered his Inaugural Address. In the course of it he dealt with the chief points of interest in the papers read and discussed during the past session, and referred to the professional visits undertaken during the summer; the Crystal Palace District Gas-Works being among the places selected. The President next referred to the growth of the population of the world, and the corresponding development of engineering enterprise; also to the present unsatisfactory condition of the London sewage question, in reference to which he had received from Sir R. Rawlinson an epitome of his solution of the sewage difficulty as being "Out of the River Thames and into the Sea over the Maplin Sands." The work of the recent International Congress of Hygiene and Demography, especially in reference to the section of "Engineering in relation to Hygiene," was touched upon; and it was felt that, although a great deal had been done, much still remained to be accomplished in relation not only to the disposal of sewage, but also to the adequate supply of water to, and the prevention of smoke in, London. At the close of the address, a vote of thanks was heartily accorded to the President.

WATER BILLS FOR 1892.

THE following abstracts of the deposited Bills relating to water supply indicate the character of the projected legislation with regard to this subject.

The Llanbradach District and Aber Valley (Eglwysilan) Water Bill is the only measure proposing the incorporation of a new Water Company. The Company are to supply a district of Glamorganshire and Monmouthshire comprising the watershed of the River Rumney. The capital is to be £40,000, with the usual borrowing powers. The proposed works consist of an impounding reservoir on the Nant Ilan, with various wells and service reservoirs. For the protection of the Cardiff Steam Coal Collieries Company, Limited, it is provided that no water is to be taken from the Llanbradach Brook until the flow of the stream exceeds 150,000 gallons in 24 hours. The works are to be completed within seven years. Rates for domestic supply are to range from 10 to 6 per cent.

The Airdrie and Coatbridge Water-Works Bill is to authorize the Airdrie and Coatbridge Water Company to raise £120,000 of new 5 per cent. capital, to carry the usual borrowing powers. The works are to be enlarged by the addition of two impounding reservoirs, and certain burns are to be appropriated for filling them, with a specified allowance of compensation water; all to be completed within ten years. The district of supply is also defined. The East Grinstead Gas and Water Bill contains clauses for increasing the undivided capital of the Company by £40,000 in new 7 per cent. shares. The water-works are to be enlarged by the construction of a new adit and a reservoir and pumping station, to be completed within five years. Provision is made for the laying of mains in undedicated roads, and for the erection of workmen's cottages. The Exmouth and District Water Bill is to enable the Company to enlarge their works by the construction of an impounding reservoir upon the Budleigh Brook on Bicton Common; the work to be completed within five years. The Rhymney Valley Gas and Water Bill contains provisions for the transfer to new ownership of the water-works at Bargoed and Hengoed, and their extension by the construction of certain tanks and pipe-lines. This scheme appears to be to a certain extent in competition with the Llanbradach District scheme mentioned in the preceding paragraph. The rates for domestic supplies are to range from 10 to 7 per cent. The Brynmawr and Abertillery Gas and Water Bill contains provisions for defining the existing capital of the undertaking as consisting of £18,000 in shares, and £6500 by way of loan; and also for increasing the undivided share capital by £40,000. The water supply limits are to be enlarged to comprise the parish of Llanhilleth, Monmouthshire. New works are projected, including an impounding reservoir on the Tillery Brook, to be completed within six years. Certain leases to the Company are to be confirmed. The Mold Water Bill is to empower the Mold Gas and Water Company to raise £25,000 of additional 7 per cent. capital, with the usual borrowing powers; and to enlarge their works by the construction of an impounding reservoir upon the Cwm Llydan stream, which here forms a portion of the boundary between the counties of Denbigh and Flint, with the usual subsidiary works. The limits of supply are also to be extended. The Company are to be bound to furnish a continuous supply of water at high pressure to the Local Board of Mold for public purposes, at the rate of 1s. per 1000 gallons. The Pontypool Gas and Water Bill is to enable the Company to construct a reservoir upon certain common lands known as Mynydd Garn Clochdy; impounding a spring there existing, and completing the work within four years. Certain other authorized works are to be abandoned, and the time allotted in the Act of 1890 for the construction of others is to be extended by two years. The Pontypridd Water-Works Bill is to authorize the Pontypridd Water Company to construct certain additional works—comprising a reservoir across the Rhondda Fach River, impounding the waters of this and of several other streams flowing directly or indirectly into the River Taff—to be completed within ten years. Additional capital, amounting to £120,000, is required, bearing 7 per cent. dividend, with the usual borrowing powers. The North Shields Water Bill is to enable the Company of Proprietors of the North Shields Water-Works to purchase water in bulk from the Newcastle and Gateshead Water Company, and the latter are to be bound to supply such water under certain conditions, and on terms to be agreed upon. The Company's district of supply is defined; and various minor provisions of their existing Acts of Parliament are to be amended. A clause is inserted giving power for the sale of the undertaking to the Newcastle Company. The Rhyl District Water Bill is to confer further powers upon the Company. It is proposed that the Company, with the authority of three-fourths of the votes of the shareholders present in person or by proxy at a general meeting specially convened for the purpose, shall be enabled to increase their capital by £25,000, by borrowing on mortgage of the undertaking, by issuing fresh preference capital, or by a combination of both methods. A new reservoir is to be sanctioned for impounding the Dolwen stream in the parish of Llanyfydd, Denbighshire; the works to be completed within ten years. In addition to the other capital, old or new, the Company desire power to capitalize, at a 5 per cent. fixed perpetual preference dividend, a sum of £3536 expended out of revenue in the construction of works. The Sunderland and South Shields

Water Bill is to authorize the construction by the Company of further works, consisting mainly of a pumping-station to be situated in the parishes of Houghton-le-Spring and Bishopwearmouth, Durham, to be completed within fifteen years. The Western Valleys (Monmouthshire) Water Bill is for authorizing the transfer to, and the vesting in the Company of this name, of the undertaking of the Risca and Pontymister Gas Company. The consideration for the transfer is to be the sum of £9000 in fully paid-up shares of the Company, and a sum not exceeding £2000, which may be ascertained to have been expended out of capital on the undertaking between Dec. 31, 1890, and July 30, 1892. New capital to the amount of £20,000 is to be raised; and the gas and water concerns of the Company are to be kept separate.

The Abergele, Rhyl, and St. Asaph Joint Water Bill is to authorize the provision of a supply of water to the Urban Sanitary Districts of the Abergele and Pensarn Local Board and the Rhyl Improvement Commissioners and the Rural Sanitary District of St. Asaph, including the acquisition by a Joint Board of the undertaking of the Rhyl District Water Company. The capital of the Company consists of £12,000 in preference 5 per cent. shares, £1660 in preference 7 per cent. shares, and £20,753 ordinary capital. There is also a debenture debt of £12,500. The Bill recites the method by which the proposed Joint Board is to be constituted; and it proposes that the Board may require the Company to sell their undertaking, on requisition addressed to them within two years, for a price to be agreed upon or determined by arbitration in the ordinary way. Borrowing powers to the amount of £150,000 are desired for the Joint Board for carrying out the scheme. The Frimley and Farnborough District Water Bill proposes that the Aldershot Gas and Water Company, the Wokingham District Water Company, Limited, or any other water supply undertaking whose district may abut upon or lie in the vicinity of the district named, and the Surrey County Council, the Farnham Rural Sanitary Authority, the Hartley Wintney Rural Sanitary Authority, or any other authority in the district, may enter into mutual agreements for the supply of water. When any such arrangement has been concluded, the statutory limits of the supplying Company are to be extended to include the Frimley and Farnborough District. The Ipswich Corporation Bill is to enable the Corporation to acquire the undertaking of the Ipswich Water-Works Company; the consideration for the purchase being the sum of £200,000, and the stock-in-trade to be taken at a valuation. The Corporation desire to borrow £230,000 for the purposes of the Bill. Provision is made for the creation of Corporation stock. The Kilmarnock (Corporation) Water Bill is to enable the Corporation to acquire the Kilmarnock Water Company's undertaking, according to the terms of an agreement scheduled with the Bill. The consideration for the purchase is stated to be the granting by the Corporation of 10 per cent. perpetual annuities in exchange for the ordinary and preferential 10 per cent. obligations of the Company; also the grant of 6 per cent. perpetual annuities to the holders of the Company's 4½ per cent. preference shares, the taking over by the Corporation of the Company's bonded and floating debts, and the payment of £5000 in regard to unpaid dividends. The Company are to retain their reserve fund and cash balance on the last revenue account. Certain additional works are to be constructed, including an impounding reservoir on the Loch Burn and Dunton Burn, in the parish of Fenwick. Public and private water-rates may be levied; any surplus reserve being applied to the reduction of the domestic rate. The Lanarkshire (Middle Ward District) Water Bill is to empower the District Committee of the Middle Ward of the County of Lanark, who are the local authority, to construct water-works, comprising two reservoirs for impounding the Glengavel Water and the ordinary subsidiary works, from which compensation water is to be discharged at the rate of a million gallons daily. Certain special water supply districts are to be abolished. Water is not to be demanded compulsorily for premises distant more than 100 feet from the pipes of the District Committee. The Lanarkshire County Council are to be authorized to borrow so much money as the District Committee may require for the purposes of the Bill. The Rhyl Improvement Commissioners' Bill contains provisions to enable the Commissioners to acquire the undertaking of the Rhyl Water Company upon terms to be settled by agreement or ascertained by arbitration. The rate for domestic supplies is to be 7 per cent.

The Ashton-under-Lyne, Stalybridge, and Dukinfield (District) Water-Works Bill is to extend the time allotted to the Joint Committee for the completion of certain reservoirs and works to ten and fifteen years after the passing of the Act. Power is also sought for exchanging lands; and various minor amendments of the existing statutes are contemplated. The Barrow-in-Furness Corporation Water Bill is to empower the Corporation to construct an additional reservoir, to be called the Harlock Reservoir, as well as to draw water from certain streams; also to borrow for these and other purposes the sum of £45,000. The Birmingham Corporation Water Bill is to empower the Corporation to obtain a supply of water from the Rivers Elan and Caerwen, and their tributaries, in the counties of Cardigan, Radnor, Brecknock, and Montgomery, at a cost of £6,600,000 for the necessary works and land. The latter is to be acquired within seven years; and the works, 50 in number, are to be executed under various restrictions—among these being the discharge of compensation water down the Elan watercourse after the rate of not less than 22½ million gallons daily. The Bradford Corporation Water-Works Bill is to vary the provisions of the last Corporation Water Bill so as to alter the principle of collecting the water required from pumping to gravitation, which involves the abandonment of some authorized works and the substitution of others in different places. The Blackburn Corporation Bill contains a clause for extending the limits of water supply. The Glasgow Corporation Water Blll is to authorize the Corporation to construct certain aqueducts and to abandon others previously sanctioned. It also contains clauses to enable the Corporation to supply water for hydraulic power purposes, and to enter into arrangements with landowners for preventing the pollution of the waters of Loch Katrine and Loch Arklet. The Ilkley Local Board Bill has a section relating to water supply, which comprises clauses for extending the limits and enlarging the water-works under the control of the Board by the construction of an impounding reservoir on Ilkley Moor. The sum of £15,000 is to be borrowed for this purpose. The Leeds Corporation (Consolidation and Improvement) Bill contains a section devoted to the water undertaking. Most of the clauses are re-enactments, but there are some new provisions, among others being a clause fixing the water-rates for business premises not occupied as dwellings otherwise than by a caretaker. Power is asked for granting discounts for prompt payment of water-rates, and forbidding the use of hose pipes without permission. The sum of £250,000 is to be borrowed for water-works pnrposes.

The London County Council (General Powers) Bill contains clauses for enabling the Council to continue to conduct inquiries and negotiations relating to water supply, and to promote Bills dealing with the subject. The London Water Bill (No. 1), which has been already noticed, is for the constitution of a Water Committee of the London County Council; and the Corporation are to have power to acquire the existing water undertakings and to make new ones. The London Water Bill (No. 2) is a duplicate of this measure. The Swansea Corporation Water Bill is to empower the Corporation to enlarge their works by the construction of an impounding reservoir upon the River Cray, and carry out other works. The sum of £270,000 is to be borrowed for water purposes. The Tredegar Local Board Water Bill is to authorize the Board to enlarge their works by drawing from a certain spring named, and to extend their district. It is provided that, when they shall be able to supply the whole of their district, the statutory powers of the Ebbw Vale Local Board over the same area shall cease; the former Board purchasing the disused plant of the latter. A sum of £35,200 is to be borrowed for water purposes. The Uttoxeter Water Bill is to enable the Rural Sanitary Authority to improve their supply; it has hitherto been provided by an application of the proceeds of certain charities. The source is to be Bramshall Spring, in the parish of the same name, and also some other springs in the parish of Somershall Herbert. Rates for domestic supplies are to range from 12 to 6 per cent. The sum of £10,000 is to be borrowed for the purposes of the Bill.

Death of Mr. C. King.—We regret to record the death of Mr. Charles King, of High Wycombe. Mr. King was formerly Assistant-Manager of the Malton (Yorks.) Gas-Works; but he relinquished the position not quite two years ago to take the appointment of Secretary and Manager of the High Wycombe Gas Company, in succession to the late Mr. E. E. Phillips.

Sir Douglas Galton on Ventilation, Warming, and Lighting.—The thirteenth course of lectures and demonstrations for sanitary officers, held in connection with the Sanitary Institute, was commenced last Friday evening, at the Parkes Museum, Margaret Street, W. Sir Douglas Galton delivered the lecture; and he dealt with the subjects of ventilation, warming, and lighting. The larger part of the lecture was devoted to the first-named subject. Having referred to the composition of air, he enlarged upon its density, dilatation, and movement; and then described various simple methods of changing air in rooms. In connection with the second part of his lecture, Sir Douglas discussed the methods of generating heat in houses—by open fireplaces; by warmed air conducted into rooms by flues from a central source; by closed stoves; and by hot-water pipes. This led up to a brief reference to the warming and ventilation of large buildings by mechanical means. So much time was occupied in the consideration of the first two sections of the lecture, that Sir Douglas was only able to touch very lightly upon the third. He explained the chemical action which occurred in the development of artificial light; and then remarked that, from a hygienic aspect, perfect combustion was most essential to the maintenance of the purity of the air of a room, as if it was imperfect various impurities would be thrown off. It was also essential that the agents used to produce the light should be as pure as possible. Oil gave a light which had the least injurious effect upon the air of a room; and, taking an equal light, coal gas threw out more impurity into the air, and also produced a larger amount of heat. The only real hygienic light was the electric incandescent light. The arc light, which was in contact with the air, gave off a certain quantity of nitric acid, and was therefore not so hygienic as the incandescent light. The lecture was a very interesting one, and was illustrated by a large number of diagrams and tables.

NOTES.

The Recovery of Cyanides from Coal Gas.

A patent has been obtained for the United States by Mr. W. L. Rowland, of Philadelphia, for a process of recovering cyanides from coal gas. It consists in the addition of an iron salt to the water used in the ordinary way for taking ammonia out of the gas in the usual forms of washing or scrubbing apparatus. The proportion of the salt to be added to the washing water is to be sufficient to remove cyanides, but insufficient to remove sulphides; thus enabling the cyanogen compounds to be removed as soluble ferro-cyanide of ammonia along with the ammonia compounds usually recovered. The invention also comprises the method of recovering the ferro-cyanides from the ammoniacal liquor, which consists in first adding a portion of iron salt to the liquor, boiling off the ammonia in the usual manner, and treating the settlings with lime in order to obtain a solution of ferro-cyanide of calcium. Then for the second stage an alkaline chloride or sulphate is added to this solution, to form the double salt ferro-cyanide of calcium and the alkali, and finally decomposing this with an alkaline carbonate, to produce an alkaline ferro-cyanide, which may be crystallized out in the usual manner.

Austrian Tests for Portland Cement.

Austrian engineers test Portland cement under rules practically identical with those employed in Germany. The method for ascertaining whether a cement is free from any tendency to blow or expand in air consists in the employment of the firing tests in conjunction with the wet-pat tests. The first is carried out as follows: The cement is gauged with water to the normal consistency, and spread out upon two glass or metal plates in the form of pats 10 centimetres in diameter, and 1 centimetre thick. In order to avoid shrinkage cracks, the pats are protected from draughts and from direct sunlight, preferably by being kept in a moist chamber. After 24 hours they are gradually heated in an air-oven to a temperature of 120° C. for two or three hours, until all perceptible water vapour has been driven off. If radial cracks should then appear at the edge of the pat, the cement is unfit for use in air; but it is necessary to discriminate carefully between these cracks and those due to mere shrinkage, which do not appear at the edge of the pat. The influence of calcium sulphate in causing cement to crack is not detected by this test; but it becomes evident from the result of the wet-pat test. In the latter test, which shows the suitability of the sample for use under water, the same gauging and precautions to avoid the formation of shrinkage cracks, as with the dry-pat test, are necessary to begin with. After having been allowed to set for 24 hours, the pat is kept in water for 27 days. The other tests for breaking strength and fineness of grinding do not call for special comment. Sometimes the pat that has been kept for 27 days under water crumbles on exposure to the air. This is due to the cement having been too new when gauged, and is prevented by aëration.

Electricity a Bye-Product of Heating Apparatus.

A remarkable thermo-electric stove has been invented by Dr. Giraud, of Chantilly, who has been turning his attention to the problem of heating and lighting from a single source. This apparatus has the external appearance of an ordinary heating-stove. It differs widely, however, from common stoves in its internal arrangements. The products of combustion rise vertically through a cylindrical chamber, and then descend by an annular space formed by the walls of this cylinder and those of another which surrounds it. In their course, the products of combustion are brought into contact with a number of rectangular boxes stamped out of sheet iron, which contain the thermo-electric elements. These are about seven in number, and consist of couples of nickelled or tinned iron and an alloy mainly composed of zinc and antimony. Other metals are added in small quantity, but merely to prevent the composition from being too fusible. The elements are insulated by asbestos; and cooling is effected partly by the shape into which the elements are cast, and partly by circulation of air. The useful output is stated to be 40 watts, equal to about one kilowatt-hour per day of continuous working, to produce which some 62 lbs. of coke would have to be consumed in the stove. Even at the price ruling for coke in Paris (2·75 frs.per cwt.), this would make the electricity cost about 15d. per kilowatt-hour, or Board of Trade unit, which is the rate charged by the Paris central lighting stations. So far the facts appear to be favourable to Dr. Giraud's system; but the current from his thermal couples is so small that it would take an altogether disproportionate amount of stove capacity to supply any considerable proportion of light; and, in consequence, storeage batteries would have to be used, which means more loss. On the other hand, it is argued that heating is required for many more hours than lighting; so that the electrical energy which would be otherwise lost during the hours of daylight would be conserved by the accumulators. Moreover, it is to be remembered that the heat utilized in this way by Dr. Giraud is waste heat, so that any portion of it that can be recovered in the form of electricity is so much gain. There is something fascinating about the idea of placing thermo-electric piles in the smoke-flues of boilers, &c., and so obtaining power that can be utilized for lighting.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

PART III.—A CRITICAL EXAMINATION OF MODERN PRACTICE.

(*Continued from p.* 154.)

The question that suggests itself, after due consideration of the mathematics of lighting and of the practical examples of street illumination to which reference has been made in these articles, is whether there is any convenient numerical expression to be found for the difference between good and bad street lighting—whether it is possible to arrive at any *number* which shall give the measure of spottiness in a way that is useful for calculations of lighting effect. For instance, how can we expose in positive figures the fallacy which underlies such attempts as that of Professor Robinson, already referred to, to make out that because an ordinary street gas-lamp gives a certain light-effect at an arbitrarily chosen distance from the post, therefore this system of lighting may be regarded as exchangeable with electric arc lighting producing the same effect at very much greater range?

The author ventures to propose a method of answering this question, which depends upon the proposition that whatever may be the gross quantity of light employed in any case of street lighting—whether the lighting is done by 5-feet gas-burners or by 1000-candle power electric lamps—*the practical measure of the efficiency of the lighting is given by the difference between the brightest and the dimmest parts of the illuminated area.*

This proposition recalls the observation that has already been made, as to the necessity of raising the minimum effect commensurately with the maximum brilliance. The construction of the human eye requires this concession, which has never been clearly set out in these terms by previous writers upon the general subject. A degree of obscurity between lamps which is endurable with ordinary 5-feet gas-burners, is unendurable when the brilliance of the light-sources is increased fifty or a hundred-fold. Simple and obvious as this statement appears to be when made in this way, its truth is constantly being ignored by the self-styled scientific persons who advocate electric arc lamps for streets, when considerations of economy prevent their being spaced thickly enough to escape the reproach of spottiness. Electric arc lamps can, of course, be used with brilliant effect in street lighting; but they must be placed much closer together than can usually be afforded, if the unevenness of the effect is not to amount to an absolute nuisance. The same may be said of high-power gas-lamps, although in their case the brilliancy of the direct rays entering the eye is not so great as to paralyze this organ, as in the case of the electric arc; and it is therefore not necessary to elevate them so high above the roadway, and thus sacrifice illuminating power.

The test for the true efficiency of street lighting which the author now proposes is intended to apply to all lighting when the light-sources are spaced at greater distances than those deducible from the Heath formula of the radius commanded being 1·42 times the height of the lamp above the plane of the area lighted. The rule proposed is: That the true efficiency of any system of scattered lighting is represented by the numerical difference between the light-intensity calculated from the darkest spot, and the light-intensity of the same flame at distance unity from the vertical passing through the source.

Take an example from what would be called good ordinary street lighting, without any pretension of display, such as that of 5-feet gas-burners at a height of 10 feet above the pavement—the lamp-columns being 30 yards apart on both sides of a 45-feet roadway. Supposing the columns to alternate on the opposite sides of the road, the darkest spot might be taken as occurring along the line of the curb at mid-distance between the lamps. At this point, light would be received from three lamps at equal distances of 45 feet. Consequently, it is necessary to determine the intensity of the light from one source, and then to triple it. Let the illuminating power of the lamps be taken at 12 candles. The slant distance from the gas-flame 10-feet high to a point on the ground 45 feet away is $d^2 = 45^2 + 10^2 =$ rather more than 46 feet. Hence, by the formula applicable in this case, the intensity $i = \frac{12 \times 10}{46^3} = \frac{120}{97336} = 0{\cdot}0012$, which multiplied by $3 = 0{\cdot}0036$. Let us call this number the index of minimum intensity. In the same way the index of the maximum intensity will be $i = \frac{12 \times 10}{10^3} = \frac{120}{1000} = 0{\cdot}12$. The index of true efficiency is therefore, according to the proposition, $\frac{0{\cdot}12}{0{\cdot}0036}$, or 33·3.

Take for a further example some data supplied by the Belfast lighting. In the Royal Avenue, from North Street to Castle Place, there are 100-candle lamps at intervals of about 24 yards on each side of the street; the columns being of such a height that the flames are 15 ft. 6 in. above the pavement level. The street is about 60 feet wide. Here the darkest spot in the line of the kerb will be midway, at a distance of 36 feet, between two lamps on the same side of the way, and it may also receive light from a third lamp immediately opposite, at a distance of 60 feet. In this case, the distance $d = 47$ feet nearly from the

lamps on one side of the road, and close upon 62 feet from that which crosses the road. Hence $i = \frac{100 \times 15{\cdot}5}{47^3} = \frac{1550}{103823} = 0{\cdot}014$ for the first effect; and $i = \frac{100 \times 15{\cdot}5}{62^3} = \frac{1550}{238328} = 0{\cdot}006$ for the second. Multiplying the former by two, and adding the latter, we have 0·034 as the index of minimum intensity. For the index of maximum intensity we have—

$i = \frac{100 \times 15{\cdot}5}{15{\cdot}5^3} = \frac{1550}{3723{\cdot}87} = 0{\cdot}42$. The index of efficiency is consequently $\frac{0{\cdot}42}{0{\cdot}034} = 12$.

Again, the electric lamps in Queen Victoria Street, in the City of London, are of about 1000-candle power nominal, and 700-candle power effective; being nine or ten ampère lamps in wavy glass lanterns. This is an outside valuation; but it is better to state the case at its best. The light is exhibited at the height of about 18 feet above the pavement; the columns being spaced about 50 yards apart. The darkest spot is midway between two lamps on the same side of the street, and opposite a third. Hence the minimum of lighting effect is that afforded by two lamps each 50 yards away, with the addition of that of a third 22 yards distant. (It must be understood that these distances are only approximate, because the lamps are, as a matter of fact, placed wherever street corners, refuges, &c., offer a suitable place, equality of spacing being only a secondary consideration in the arrangement.) The main object in this calculation is to give the utmost value to the system of lighting. Here the slant distance d is in the first case 155 feet nearly, and in the latter case rather more than 68 feet. Hence—

$\frac{700 \times 18}{155^3} \times 2 + \frac{700 \times 18}{68^3} = 0{\cdot}046$ for the index of minimum intensity. For the maximum intensity we have $\frac{700 \times 18}{18^3} = 2{\cdot}14$; so that the measure of efficiency is $\frac{2{\cdot}14}{0{\cdot}046} = 46{\cdot}5$.

Recently there was a question of the best way of lighting the Marine Parade at Hastings and St. Leonards; the choice lying between electric arc lamps 100 yards apart, and 100-candle gas-lamps at distances of 30 yards. The lamps being in a single line, there is no question here of cross-lighting; and the darkest place is midway between the lamp-posts, where the minimum light intensity must be twice the calculated intensity at this spot from one light-source. In the case of the electric lighting, we will assume the effective illuminating power to be 700 candles (a high estimate when opal globes are concerned), and the light to be 18 feet high, as in Queen Victoria Street, City. Here we have an index of minimum intensity of 0·007, and a maximum of 2·14; so that the difference is $\frac{2{\cdot}14}{0{\cdot}007} = 305{\cdot}7$. With the gas-lamps as proposed, assuming the light to be exhibited at the same height of 15 ft. 6 in. as in the Belfast example, we have a darkest spot 45 feet from the lamp. The distance d is $45^2 + 15{\cdot}5^2 = 47{\cdot}5$ nearly. Whence we have $\frac{100 \times 15{\cdot}5}{47{\cdot}5^3} \times 2 =$ 0·028 for the minimum effect, and 0·42 for the maximum effect. The difference is therefore 15. Expressed in popular terms, this result might be put as showing that, whereas the brightness immediately under the electric lights is upwards of *three hundred times* that of the darkest places, in this system of lighting—a degree of "spottiness" which a blind man could appreciate—the difference in the case of the gas is only *fifteen times*. Again, whereas immediately underneath the lamps the comparative brilliancy between the electric and the gas lamps is as 2·14 candles to 0·42 candle, or a superiority of slightly more than 5 to 1 for the former, in the darkest spots midway between the lamps the difference is 4 *to* 1 *in favour of the gas*. If a chain is no stronger than its weakest link, certain it is that a scheme of outdoor lighting for promenade purposes is to be estimated by its darkest places.

The formula herein given may be applied in a variety of ways; but we can see, by the examples selected, that any specimen of outdoor lighting may be judged with reference to the two principal considerations of the minimum intensity and the difference between this and the maximum effect. The value of the former may be anything, according to the scale upon which the lighting is done. It will rarely be necessary, however, to exceed the Belfast figure of 0·034 candle for cross effects (that is, when a street is lighted by alternately spaced lamps), or the Hastings Marina minimum of 0·028 candle for a single row of lights. With regard to the index of practical efficiency, which is the name here given to the difference between the best and the worst effects, it should clearly be kept as low as possible. It is hardly practicable to get it below 12 or 15, with cross or linear outdoor lighting respectively; and the best electric arc lighting in London runs it up to nearly 50, which should never be exceeded.

(*To be continued.*)

Mr. Frank Vivian, who has been managing the Llanelly Gas-Works since the resignation of Mr. A. G. Browning in November last, has now been permanently appointed Manager and Secretary of the Company.

TECHNICAL RECORD.

FUEL GAS: ITS PRODUCTION AND DISTRIBUTION.

A Paper read by Mr. Arthur Kitson before the Franklin Institute.

(*Concluded from p.* 158.)

I will now briefly describe the apparatus which I have designed for the manufacture of semi-water gas, and which I am now using, in connection with the Körting gas-engine, for the production of power. This furnace has been in operation for some time driving the gas-engine, which supplies power to a dynamo; and this in turn charges a storeage battery. The battery furnishes current for a number of incandescent lamps, and occasionally for a small electric motor.

The producer occupies about 10 square feet of floor space, and stands 8 feet from the floor to the top of the feed hopper. This will furnish 1500 cubic feet of gas per hour. The machine consists of a cylindrical shell of boiler-iron, lined with fire-brick. The internal diameter of the brickwork is 21 inches, and the height from the grate to the top of the furnace is 3 ft. 6 in. The grate is connected on one side with a steam and air injector; on the other, with the gas-supply pipe (which runs to the place of consumption), and is surrounded by a cast-iron box, which is securely attached to the cylindrical shell, forming the ash-pit. The whole machine is supported on four cast-iron legs. The ash-box terminates in a mouthpiece, which is opened and closed with a valve operated by a lever from the outside; and it serves to dump the ashes, whenever desirable, without interfering with the process of making the gas. The top of the furnace is closed by an iron plate; and upon this the hopper for feeding is securely fastened. An opening is provided in the plate for a pipe leading to the chimney. Another connection leads also to a gas-supply pipe; each of these pipes being opened and closed by valves. A small reservoir forming the boiler is placed on one side; and communicating therewith are two coils contained in the brickwork. The lower coil heats the water and furnishes steam; while the upper coil superheats it. Water is pumped into the boiler from time to time. An injector is also provided at the top of the furnace. Air channels are arranged spirally in the brickwork, through which air is drawn by the injectors. The air thus becomes heated before mixing with the steam, which must be thoroughly dry. The walls of the furnace are inclined inwardly towards the top, and outwards towards the bottom; thus throwing the entire weight and body of the fuel on the grate. This is provided with mechanism for giving it a rotary and up-and-down motion, the effect of which is to break up any clinker that may have adhered to the sides of the furnace, keep the coal in a compact mass (avoiding holes in the fuel), and throw the dust and ash into the ash-pit. The caking with soft coal is effectively broken up; and the steam finds an easy passage through it.

The entire gas plant I have described is simple, cheap in construction, and economical in its working. It can be made small enough to produce 500 cubic feet per hour, which means a consumption of only 6 or 7 lbs. of coal. It is easily set up, taken down, and removed. There is no danger from fire or explosion; and it requires but ordinary care, as in the case of a coal furnace.

Let us now consider in what manner we may utilize our gas, and ascertain the results obtainable; commencing with the subject of power. It may astonish the general public, who are accustomed to regard the highly-developed steam-engine as the perfection of human ingenuity in the transformation of heat into work, to learn that the gas-engine, with all its imperfections, is a far more efficient instrument. Although the gas-engine is limited in various ways, in capacity and power, and is, mechanically speaking, vastly inferior to the steam-engine, its absolute efficiency is at least double that of its rival. The absolute efficiency of the gas-engine is 20 per cent., and has in some cases exceeded 22 per cent.; while that of the best steam-engine never exceeds half this amount. With illuminating gas, a consumption of from 25 to 30 cubic feet per hour in any of the standard gas-engines will develop one actual horse power, which is equivalent to a consumption of from 15,000 to 18,000 thermal units.

I have made a considerable number of experimental tests of semi-water gas with Körting gas-engines, varying in size from 18-horse power down to 2-horse power, and found no difficulty, with a consumption of 85 cubic feet, in developing an actual horse power by brake test. This is equivalent to $1\frac{1}{4}$ lbs. of coal per horse power per hour. For several years a well-known firm in Manchester have supplied their works with power by means of gas-producers and gas-engines; and they claim that the cost has not exceeded $1\frac{3}{4}$ lbs. of coal per horse power per hour. A recent test with an Atkinson engine gave 1-horse power with 1·11 lbs. per hour. In comparison with the steam-engine, these results are startling. Compare, for instance, the efficiency of the best steam plant—comprising furnace, boiler, and engine—with a gas-producer and gas-engine. It is hardly fair to make comparisons with very large steam plants, for the simple reason that the largest gas-engine does not exceed 100-horse power.

A 50-horse power steam plant of the most approved pattern will consume 45,000 thermal units in the production of each horse power per hour—an efficiency of less than 7 per cent. In the largest plants, the efficiency will not exceed 10 per cent. Now take the gas plant. We get an efficiency of 80 to 85 per

cent. in the producer, and an absolute efficiency of from 14½ up to nearly 19 per cent. for the entire plant. Here is a method for the supply of power for which there is an unlimited field; and, notwithstanding the years that have elapsed since attention was first called to the subject, it is entirely unknown to the public generally. Instead of large reservoirs for the supply of steam, we may generate gas as required; converting its potential energy into useful work more economically and more efficiently than has ever been dreamed of by steam engineers. The gas-producer and the gas-engine must eventually supplant steam—at least, for all small uses.

My experiments showed me: (1) That it is decidedly advantageous to clear the cylinder entirely of the exploded products before taking in a fresh charge; (2) that a higher compression than that ordinarily used with illuminating gas is beneficial; and (3) that sufficient time should be allowed to enable the gas and air to intermingle in the exact proportions for combustion, before ignition. The presence of a small proportion of the exploded products in the new charge affects this quality of gas much more disastrously than where a richer gas is used. There being already 50 per cent. of non-explosive gas in the charge itself, the addition of a small percentage of so injurious a diluent as carbonic acid gas injures the explosive force of the charge materially. The best effects from the use of this gas may therefore be expected from engines having a variable piston stroke, such as the Atkinson. The disadvantages attending the slow combustion of carbonic oxide gas (especially when this gas is accompanied by much nitrogen) is, to a great extent, remedied by high compression. High compression also increases the capacity of a given-sized engine—a decided advantage where semi-water gas is used.

The outlook for the gas producer and engine is very encouraging, and bids fair to out-rival the steam boiler and engine. Not only is it more economical in the conversion of potential heat units into work, but there is less labour involved, and less danger. The results I have mentioned may at first sight seem startling, especially to those accustomed to the use of small steam plants, where the consumption of coal varies from 4 up to 10 lbs. of coal per horse power. So accustomed have we become, in our crude utilization of natural forces, to throw away more than we use, that we are apt to lose sight of the proportion and magnitude of such waste.

Every factory and household chimney, every locomotive stack, every ash-pit and dust-bin, testifies to the frightful extravagance in our modern and much-vaunted methods of utilizing fuel. When we reflect that in every pound of coal lies hidden a force which, if wholly utilized, would furnish 4 or 5 horse power, while at present we employ at least 10 lbs., and often 40 lbs., to accomplish the same results, and that in our highly-efficient gas motor we consume 5 volumes to obtain the energy contained in one, some idea of the present wasteful methods of producing power may be realized. The prediction, therefore, that the gas-engine and gas-producer will shortly furnish power with 1 lb. of coal per actual horse power per hour, is only incredible to those who regard present achievements as the summit of human attainment.

This question of cheap power brings us directly to another—the production of light. The great obstacle the electric light encounters when competing with gas is the cost of power. Here, it seems to me, is a solution of the problem. Taking an incandescent electric plant capable of furnishing ten lamps of 16-candle power per actual horse power, the cost of coal would be less than 0·25c. per hour. This would permit the use of storeage batteries, and allow a margin for loss in discharging. The gas is also available in connection with incandescent gas-lamps, such as the Welsbach and Lungren. I have used the former with success. The Kitson water-gas lamp, in which the gas is carburetted by the vapour of naphthalene, produces a very beautiful light with semi-water gas.

For heating purposes, the uses of this gas are almost endless. With properly constructed burners, gas cooking and heating stoves are available for domestic purposes; while for industrial work its different spheres are legion—brick and lime burning, soldering pots, singeing yarns, roasting and smelting furnaces, cupolas, &c. In fact, wherever artificial heat is required, this gas may be made available in one special way or another.

Chief among the items that make the price of gas high to consumers is the cost of distribution; and in large cities it is certainly attended with the greatest conceivable annoyance and expense. The breaking up of roadways, the laying, re-laying, and repairing of pipes, the loss from leakage, the actions for damages, the conflicts with city councils, surveyors, street car companies, and property owners—all these things serve to make the lot of a gas company at times anything but a happy one. These expenditures have to be met, and serve to make the price of gas to the consumer wholly out of proportion to its cost of manufacture.

The plan I wish to suggest for supplying fuel gas in its three departments, as light, heat, and power, is to bring the place of manufacture and point of consumption as near together as possible, and avoid long distance of delivery. I would let every block of houses contain its own gas-works and electric light station. A basement in the centre of a block would be provided and equipped with several gas generators, engines, dynamos, and storeage batteries. This plant I would erect in a substantial manner, and, where necessary, dig below the basement for several feet. I would put in good foundations, and sink the generators considerably below the floor level, for convenience in supplying the hoppers with coal. One set of generators I would keep constantly in operation, running gas-engines which would operate the dynamos, continually charging the storeage batteries to supply the necessary lights. This part of the plant I would operate for 24 hours a day, so as to reduce the size and cost of the plant requisite to do a given amount of work. Another set of generators would furnish gas for heating and cooking purposes. Boilers would be used for supplying steam heat or hot water in the ordinary manner. Pipes would be run from the main tank to each house in the block, and wires connected from the storeage batteries in the customary way. It would be necessary to have a small holder under each house; and this I would also sink below the floor level in the basement. This holder would regulate any great variation in the supply of gas. Each block would thus be provided with its own plant, and be entirely independent of central stations and city gas companies. Duplicate sets of machines would have to be kept ready in the event of one or more of the others giving out.

The advantages to be reaped by this system would be: (1) That, owing to the short distance which the gas and electric current would have to travel, the cost of supply, as well as the amount of capital invested, would be reduced to a minimum. (2) The system avoids at once the overhead wire nuisance, and the annoyance of tearing up the streets to alter and change the gas-mains. (3) Consumers would be entirely independent of City Councils and City franchises; they would have simply to consult themselves and their own interests, and deal with their own property. (4) An accident to one gas plant would not interfere with the lighting of a whole district, as is the case under the present system.

By this method of distribution, you will see that the objection urged against the carrying of a quantity of inert gas, necessitating very large mains, disappears.

COMPARATIVE WORKING EXPENSES OF SMALL MOTORS.

At the last Meeting of the Association of German Engineers, some interesting statistics were presented by Herr C. Korte on the subject of the comparative cost of working small motors. An abstract translation of the paper appears in the Proceedings of the Institution of Civil Engineers, from which we take the following particulars:—

The statistics embodied in the communication are the result of investigations undertaken by the author for the purpose of fixing a tariff for the use of the municipal hydraulic mains and electric current at Barmen. It is practically impossible to give any figures capable of universal application, as the chief factor—the cost of generating the motive power—must necessarily vary according to the local prices of coal, gas, water, &c., and wages. As far as possible, however, the result has been given in general terms, with the proportion which, upon such basis, the cost of motive power alone bears to the total working expenses, so that the corresponding figure for other prices is readily obtainable. Small motors may be divided into two categories—viz., (1) those which are worked from a central point, under either municipal or private control, and which include gas, hydraulic, electric, and compressed-air motors; and (2) those which are worked independently—viz., steam, hot-air, and petroleum engines, &c.

In estimating annual working expenses, two examples are given—viz., for 300 days of five and ten hours respectively, or 1500 and 3000 hours per annum; and it is assumed that the work is performed under average fair conditions—viz., as continuous as possible, and at nearly full power. In practice, this is, of course, a very variable condition; and as interrupted working, or running for short periods only, naturally increases the cost, the figures represent the minimum working expenses. With regard to the various classes of motors, it may be noted that in gas motors ¼ and ½ horse power sizes have vertical cylinders; the larger sizes being horizontal, and more economical in their consumption of gas. Comparative figures are given for four different prices for gas—viz. 2s. 10d. per 1000 cubic feet, as at Düsselldorf, Dortmund, Elberfeld, &c.; 3s. 4d. per 1000 cubic feet, as at Cologne, Hanover, Frankfort-on-the-Main, Barmen, &c. (Berlin slightly higher), 4s. 3d. per 1000 cubic feet; as at Leipzig; 7s. per 1000 cubic feet, as at Paris. In most cases the bulk of the consumption for motors is during the daytime; and a considerable reduction—from 30 to 60 per cent.—off the price charged for lighting purposes is allowed. At Barmen, in 1884, with gas at 5s. per 1000 cubic feet and no discount for motors, the annual consumption under this head was a little more than 4 million cubic feet; but with an allowance beginning, in 1885, at 10 per cent., and since increased to 33¾ per cent., the present rate of consumption is upwards of 18 million cubic feet. Hydraulic motors are based on Munich estimates, and for working at six atmospheres. No reduction is allowed at Barmen—for which the estimate is framed—for electric current for motors, as against lighting. The statistics for compressed-air motors are based on estimates for Paris, which are above what may be accomplished in other places; and the author notes that these figures may be considerably reduced in consequence of recent improvements in this class of motor. In connection with steam

power, it may be mentioned that it is placed at a considerable disadvantage by intermittent or irregular running. In the larger sizes and with regular working, and when the price of coal is not excessively high, the steam motor competes very closely with the gas motor; but in the smallest sizes, the gas-engine is practically the only motor to be considered. The hot-air engine is the only other system in which the working expenses compare at all with gas and steam. The author has not investigated the cost of working petroleum motors; but he considers that they have a great future before them. The cost of working hydraulic motors and electro-motors will doubtless in time be much reduced, when competition results in effecting improvements in the central distributing stations and the transmission of power. In the case of hydraulic power, the working expenses may be considerably diminished when the waste water can be further utilized.

Size of Motor, H.P.		¼	½	1	2	3	4	6
Class of Motor.	Locality.	£ s.	£ s.	£ s.	£ s.	£	£ s.	£ s.
Gas	London	33 0	60 0	80 0	120 0	155	170 0	195 0
	Paris	38 0	60 0	88 0	112 0	130	152 0	200 0
	Cologne	32 10	60 0	75 0	92 10	110	132 10	180 0
Compressed air	Paris	157 10	232 10	385 0	461 10	538	604 10	716 10
	Augsburg	75 0	157 10	190 0	250 0	300	390 0	575 0
Steam	Paris	..	..	87 0	112 0	133	167 10	200 0
	Germany	..	..	68 15	83 0	105	132 10	158 0

Gas Motors.

Size of Motor, H.P.	¼	½	1	2	3	4	6
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
Cost, inclusive of bed	38 15	68 15	84 14	104 9	124 4	149 5	202 0
Cost of working 1500 hours—*i.e.*, 300 days at 5 hours, with gas at 2s. 10d. per 1000 cubic feet	11 13	16 18	21 15	32 19	43 2	54 9	75 6
Cost of working 3000 hours—*i.e.*, 300 days at 10 hours, gas as above	16 8	23 5	30 13	49 18	66 16	85 18	119 16
Cost of gas as above in percentage of total working cost for 3000 hours	45	45	50	59	67	64	69

Cost per H.P. per Hour.

Price of Gas per 1000 Cubic Feet.	Daily Working Hours.						
s. d.		d.	d.	d.	d.	d.	d.	d.
2 10	5	7·44	5·40	3·48	2·64	2·28	2·16	2·04
	10	5·28	3·72	2·40	2·04	1·80	1·68	1·56
3 4	5	7·92	5·76	3·72	2·88	2·52	2·40	2·28
	10	5·76	4·08	2·64	2·28	2·04	1·92	1·80
4 3	5	8·64	6·24	4·08	3·24	2·88	2·76	2·52
	10	6·48	4·56	3·00	2·64	2·40	2·28	2·16
7 0	5	11·04	7·92	5·28	4·44	3·96	3·84	3·60
	10	8·88	6·24	4·20	3·84	3·48	3·48	3·24

Comparative Summary of Cost per Horse Power per Hour.

Size of Motor, H.P.		¼	½	1	2	3	4	6
Class of Motor.	Hours Daily.	d.	d.	d.	d.	d.	d.	d.
Gas motor (gas at 3s. 4d. per 1000 cubic feet)	5	7·92	5·76	3·72	2·88	2·52	2·40	2·28
	10	5·76	4·08	2·64	2·28	2·04	1·92	1·80
Hydraulic motor (water at 6½d. per 1000 gallons)	5	12·12	10·80	9·72	9·00	..	..	..
	10	10·56	9·84	9·12	8·64	..	..	..
Electro-motor (at Berlin tariff)	5	8·88	7·22	5·88	5·04	4·68	..	..
	10	7·56	6·48	5·40	4·80	4·44	..	..
Compressed-air motor (at Paris tariff)	5	15·00	11·64	8·40	6·96	6·00	5·40	4·32
	10	13·08	10·44	7·68	6·48	5·64	5·16	4·08
Steam motor, with coal at 12s. 6d. per ton	5	..	..	4·20	2·88	2·40	2·04	1·80
	10	..	..	2·88	2·04	1·68	1·44	1·32
Steam motor, with coal at 20s. per ton	5	..	..	4·92	3·48	3·00	2·82	2·28
	10	..	..	3·48	2·52	2·16	1·92	1·68
Hot-air motor, with coal at 12s. 6d. per ton	5	11·28	6·72	4·44	3·36	..	..	..
	10	6·48	4·08	2·76	2·16	..	..	..

The Meteorology of Nottingham.—We have received a copy of the tables relating to the meteorology of Nottingham for the past year, compiled by Mr. A. Brown, M. Inst. C.E., the Borough Engineer, and Mr. P. Boobbyer, M.B., the Medical Officer of Health. They are accompanied by an elaborate chart showing the relations of the number of deaths from various causes to the principal meteorological conditions on each day of the year.

Additional Gasholders for the Manchester Gas-Works.—The Gas Committee of the Manchester Corporation have decided to erect three new gasholders. One of these, to be put up at the Bradford Road station, will be 250 feet in diameter, and be capable of containing 7 million cubic feet of gas; another, to hold 1½ millions, will be erected at the Gaythorn station; and the third, for 500,000 cubic feet, at the Droylsden station. The Committee have placed the preparation of the drawings and specifications for these holders (which will raise the storeage capacity of the works to 24 million cubic feet) with Mr. G. Ernest Stevenson, M. Inst. C.E., who a few months ago was appointed Manager of the Rochdale Road station.

THE GALICIAN PETROLEUM INDUSTRY.

At a recent Meeting of the London Section of the Society of Chemical Industry, Mr. Boverton Redwood read a paper on the above subject.

The general applications of petroleum, and its special use for carburetting water gas, and for making oil gas for admixture with coal gas, was first touched upon by the author, who next gave a historical account of the industry in Galicia. Petroleum, he went on to say, is mentioned in records of the seventeenth century, and in a government decree in 1810, from which date oil fit for burning in lamps was produced, until 1818, when it appears to have been neglected until 1852. In that year, a liquid was observed to condense from the paraffin which was in common use as a cart-grease; and, on purification, it was found to burn satisfactorily in lamps. In 1853, petroleum began to replace candles in Galicia; but it was not till 1891 that the first important well was dug. In treating at some length the geographical and geological distribution of the oil, the association of the oil-fields of Europe with important mountain ranges, and the occurrence of the oil in belts having a general north-westerly or south-easterly direction, were the points most insisted upon. The petroleum district of Galicia is situated on the northern slopes of the Carpathians, and is some 260 miles in length, with an average breadth of about 40 miles. Mr. W. Topley, F.R.S., was quoted as the authority for the geological data, from which it appeared that the Carpathians consist chiefly of sandstones of the Eocene, Cretaceous, and Neocomian strata; and in the latter stratum, which in places has been forced up to the surface, the bulk of the petroleum occurs. Galician petroleum has a very variable density, that from wells which have been dug being heavier than that from drilled wells; the greater depth of the latter preventing the loss of volatile constituents, which doubtless takes place from oil found near the surface of the ground. The density may range from ·750 to ·950; but that of petroleum from East Galicia is ordinarily between ·830 and ·866, while that from West Galicia is usually between ·835 and ·859. These densities refer to oil from drilled wells; that of oil from excavated shafts is from ·859 to ·864.

The author provided tables showing the specific gravities and distillation products of a number of samples of the petroleum. Summarizing these, it is found that the specific gravities range from ·845 to ·901; that the percentage yield of petroleum spirit is from 7·5 to 12·0, of kerosene from 32·5 to 38·4, and of paraffin and heavy oil from 40·0 to 50·8; while 1 to 5 per cent. of solid hydrocarbons are also obtained. The oil from the older strata is the most limpid, and contains least paraffin. The main constituents of the petroleum are volatile paraffins. Some of the less volatile are, on distillation, probably dissociated into olefines, which occur in the distillates, though probably not in the original oil. Hydrocarbons of the aromatic series are also found in the distillates to the extent of 2 per cent. of the crude oil; but possibly their presence is likewise due to certain changes during distillation.

In the early days of the Galician petroleum industry, the wells were dug; and the substitution of drilling for digging marks a most important stage in the development of the industry. Having described the first system of drilling adopted, and then the Canadian system which was introduced in 1882, the author stated that the oil does not as a rule flow from the Galician wells, but is raised therefrom by a small diameter pump attached to lengths of gas-piping. The quantity of petroleum obtained increases each year. In 1890, it amounted to 816,000 barrels; while in 1883, it was only 166,500 barrels. Notwithstanding this increased output, 867,830 barrels of oil were imported in 1890, against 735,000 barrels in 1883. The distillation is carried on in cylindrical horizontal stills; and the burning oil is purified by treatment with 3 to 4 per cent. of sulphuric acid. The native industry is protected and encouraged by an import duty on petroleum; nevertheless, as will be seen by the above figures, the home production does not suffice for the wants of the country.

The rest of the paper was devoted to ozokerite, and its applications. This mineral, it was pointed out, occurs in Galicia in the tertiary (Miocene) formation, and is usually found associated with rock salt and gypsum. Its density varies from ·850 to ·950, and its melting-point from 58° to 100° C. It is worked by a very primitive system of mining, in which fatalities are of frequent occurrence. The amount of ozokerite remaining in the deposits is estimated at 2 million tons.

In the course of the discussion which followed the paper, some questions were put concerning the fitness of Galician petroleum for gas making. In reply, Mr. Boverton Redwood explained that, as might be suspected from its low specific gravity, it did not contain water in suspension, but only a small quantity in solution; that both it and the ozokerite were practically free from sulphur; and that he had not observed any evolution of ammonia during its distillation.

Mr. Alderman Durden, who was Chairman of the Blandford Gas Company till last year, died on the 20th ult., at the advanced age of 84 years.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Standards of Light.

SIR,—It is greatly to be hoped that the Committee on Standards of Light will see their way to the introduction of a system of gas testing by which practical uniformity may be ensured, not only in the Metropolis, but throughout the kingdom. In this view, Mr. Leicester Greville's recommendations leave something to be desired. I refer particularly to the proposal to consume such quantity of the gas to be tested in the standard Argand as will give an illuminating power of 16 candles. In my opinion, the plan more likely to conduce to uniformity would be to burn the gas at a fixed height in the chimney, and correct the indicated illuminating power to the 5-foot rate. My reasons for preferring this are as follows:—

(1) The proper development of luminosity is dependent upon a suitable air supply. The air supply is influenced by the height of the flame. Consequently, any alteration in the latter affects the development of luminosity.

(2) The height of flame is not merely dependent upon the rate of consumption; it is also influenced by barometrical pressure and temperature, and varies according to the composition of the gas.

(3) The influence of barometrical pressure upon an Argand flame does not appear to be confined solely to its effect upon the volume of gas consumed. By altering its height, it also alters the air supply; and thus affects the development of luminosity. These influences may be overcome by the adoption of a fixed height of flame, to which the present corrections would be suitable.

A height of not less than (say) 4 inches in the chimney would, in all probability, not only ensure greater uniformity in testing 16-candle gas, but would also enable a lower or higher quality of common gas such as is supplied in the provinces to be tested under practically the same conditions.

The proposal to use a 16-candle standard seems to imply that this is looked upon as a Metropolitan rather than a National question. On the other hand, a 10-candle standard does not involve committal to any particular quality of gas; and the slight difference that this would make in the distances from the disc should not be of much importance.

CHAS. HUNT.

Birmingham, Jan. 30, 1892.

SIR,—It would seem that Mr. H. Leicester Greville, in his remarks on this subject in last week's JOURNAL, ignores or overlooks, in treating of his fifth recommendation, one important consideration to which he pays heed when dealing with his first. I refer to the (in his own words) "possible effects on ratio between height of flame and illuminating power, in the event of gas companies introducing water gas." Recommendation No. 5 proposes that, instead of a rigid 5-foot consumption, the gas should be burnt to a constant 16-candle flame. Now, assuming (what has indeed been established by many observers, from Bowditch onwards) that the ratio of height of flame to illuminating power *does* vary with the composition of the gas consumed, and that, in consequence, a 16-candle flame from one gas, burnt in the standard burner, differs considerably in size from that produced by another gas of unlike composition, it follows that equal justice cannot, by this mode of testing, be done to the two gases. The only right procedure to follow is—having defined your burner—to burn each gas through it under the very best conditions, which are obtained when the flame fairly fills the chimney without smoking.

JOHN T. SHEARD.

Glasgow, Jan. 29, 1892.

Municipal v. Private Control of Gas Undertakings.

SIR,—You conclude an article on "Gaseous Fuel and Fog Prevention," which appeared in the JOURNAL for Jan. 26, by referring to the municipal control of the gas-works in Manchester and in Birmingham; and you ask: "Have these Municipalities done anything to disestablish their local fogs by reducing the price of gas to its lowest manufacturing cost?" And you answer: "Not at all. They have subsidized their ratepayers." Your answer may be correct, and your testimony may be true. Allow me, however, to apply the same question *re* the Gas Companies of London, Liverpool, and other towns. Have they done anything to "disestablish their local fogs by reducing the price of gas to its lowest manufacturing cost?" "Not at all. They have subsidized their" *shareholders*. I submit that it is incorrect to say that nobody is, or has been, the better. The *shareholders* have been the better in each case. In that of Companies, these may be strangers, whose only interest in the town is to draw as large dividends as possible from the gas-works; and in that of Municipalities, the ratepayers are the shareholders, whose interest in the town is not confined to gas, but extends to all departments of the Local Authority.

Profit is made from the manufacture of gas, whether the works are owned by a private company or by the local authority. That made by a company goes into the pockets of the shareholders, who spend it as they like, and the town is not one whit the better for it; whereas profit made by a local authority is devoted to the reduction of rates, or to the improvement of the town.

C. N.

Manchester, Jan. 28, 1892.

[Our correspondent misses the point of the original communication to *The Times*, which was that Municipalities, if they had the opportunity, would sell gas cheaper than Companies. We stated upon this that, as a matter of fact, Municipalities which have the opportunity, do nothing of the kind. This letter, indeed, yields our point; for it admits that there is no difference between Companies and Municipalities in the fundamental matter of gas-works administration, but that the latter merely put ratepayers in the place of shareholders, leaving the interest of the consumers precisely the same in each case. —ED. J. G. L.]

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.
Monday, Jan. 25.

(Before Mr. Justice DENMAN *and a Special Jury.)*

Fox v. Wildy—Action as to Shares in the British Water-Gas Syndicate.

In this case, the plaintiff, Mr. Samson Fox, sought to recover from Mr. William Lawrence Wildy the sum of £500, money alleged to have been lent. The defence pleaded was that the amount in question was given as the purchase-money for 200 shares in the British Water-Gas Syndicate, and was not a loan.

Mr. C. F. STUDD, in opening the case, said the question to be decided was as to whether the £500 was given by way of loan or as the purchase-money for certain shares. The plaintiff had been for three years the Mayor of Harrogate, Chairman of the British Water-Gas Syndicate, and Managing-Director of the Leeds Forge Company. About ten years ago the plaintiff made the acquaintance of the defendant, and engaged him in various capacities at the Leeds Forge—ultimately as engineer and draughtsman. Mr. Fox, being pleased with the way in which Mr. Wildy performed his duties, from time to time made him small presents of money, in addition to his salary, to encourage him in his work. In the autumn of 1888 and spring of 1889, the defendant was engaged in erecting and working at the Leeds Forge the first plant for water gas that had been erected in this country; and he also wrote two pamphlets on the subject of the gas. A certain amount of use was made of these pamphlets; and they were of assistance to the plaintiff. In June, 1889, Mr. Fox, being still pleased with the defendant's general conduct, with the pamphlets, and with the way in which he had done his duty, made him a present of 200 vendors' shares in the British Water-Gas Syndicate. In October, 1889, the defendant left the Leeds Forge under the following circumstances: The post of Engineer of the British Water-Gas Syndicate became vacant; and Mr. Fox obtained the offer of the situation for the defendant, at a salary of £500 a year, being an increase of £200 on the salary he was then receiving. The defendant took the appointment. On the 2nd of November the defendant called upon Mr. Fox, and told him that he owed £360 in respect of share speculations and other matters. Mr. Fox asked defendant how much he required to clear himself; and Mr. Wildy said he should want £500. Mr. Fox agreed to lend this sum, at 5 per cent. interest, taking by way of security the certificate of the 200 shares and a transfer. A transfer of the shares was thereupon executed by the defendant. In March, 1890, it came to the knowledge of Mr. Fox that Mr. Wildy was ill; and looking to see that all the documents were in order, it was discovered that the transfer was not properly stamped. Thereupon a correspondence ensued; and, in one of the letters, reference was made to the "loan." The learned Counsel was proceeding to read the correspondence at length, when

Mr. LOCKWOOD, Q.C., who represented the defendant, said he was happy to inform the Court that the case was settled. There would be, by consent, a verdict for the plaintiff for £250, to be paid in four quarterly instalments, both sides paying their own costs. The plaintiff was also to retain the shares.

Keane and Greene v. Parker-Rhodes and the United Printing and Publishing Company, Limited—Action for Libelling the Directors of the Lothammer Gas Company.

This was an action brought to recover damages in respect of an alleged libel published in the *Oracle*. The defendants admitted the publication; but they denied that it had been published falsely or maliciously, and, further, that the words were not capable of the interpretation sought to be put upon them.

The SOLICITOR-GENERAL (Sir Edward Clarke, Q.C., M.P.), Mr. F. LOCKWOOD, Q.C., and Mr. MONTEFIORE appeared for the plaintiffs; Mr. PARKER-RHODES attended in person to support his own case; and Sir CHARLES RUSSELL, Q.C., M.P., Mr. BUCKNILL, Q.C., and Mr. BANKES represented the other defendants.

Mr. LOCKWOOD, in opening the case, said the plaintiffs complained of certain statements printed in the *Oracle*, which reflected very strongly upon their conduct in connection with a Company known as the Lothammer Gas Manufacturing Company, Limited. The patents, which were the property of Mr. F. J. Lothammer, involved a process for the manufacture of gas from gasolene, which was a product of naphtha; and the process enabled the gasolene to be so dealt with that, upon atmospheric air being passed through the vapour emitted by the gasolene, a gas was produced which could be utilized by the ordinary appliances with which gas is usually consumed, though a separate apparatus was necessary to allow of its consumption. One could not turn on Lothammer gas and ordinary gas in the same pipe. Mr. Lothammer's specification described his patents as for "an improved portable apparatus for the manufacture of gas." The Company, which was formed in March, 1889, was brought to the attention of the plaintiffs, who took advice on the matter from various persons of experience—among others, from a patent agent named Prince. The Company was registered on April 29, 1889, with a nominal capital of £60,000, in £1 shares; the first Directors being Colonel H. Y. Murray (late Superintending Engineer, Bengal Presidency); Mr. Thomas A. Greene (of Messrs. H. Greene and Sons, gas engineers); Mr. C. F. Joselyne (Director of the New Durham Salt Company); Mr. J. R. R. Keane (a civil engineer); and Mr. Lothammer, the vendor of the patents. On May 2, 1889, a meeting of Directors was held; and, after reports of different experts had been read, shares to the number of 5448 were allotted. The prospectus stated that two agreements had been entered into. The first was made between Mr. Lothammer, of the one part, and Mr. L. H. Blumfield, on behalf of the Company, on the other part; and it was an agreement for the sale of the invention for £40,000 —£2000 being payable in cash, and £38,000 in shares, with power to the Directors to pay part of the £38,000 in cash. The second agreement was made between Mr. Lothammer and one Buttifant, by which

the latter undertook to pay all the expenses of promotion up to the date of allotment; and in consideration of so doing, Lothammer agreed to pay him £500 in cash and £14,500 in shares out of the purchase-money.

Justice DENMAN asked what was the nature of the libel.

Mr. LOCKWOOD said it was directed against gentlemen connected with the Company; and, inasmuch as the libels were generally made on the Company, he thought it would be better to give the initial history of the concern, in order to make the matter clear to the jury. It appeared that the Company carried on business for a time, and did substantial work. Mr. Parker-Rhodes, who was the holder of ten £1 shares, succeeded in obtaining the liquidation of the Company, and the appointment of his nominee as liquidator. Contending that he was Chairman of the Provisional Directors who had ousted the original Board, he addressed to the shareholders the circular which contained the libel.

Justice DENMAN (impatiently): What sort of conduct?

Mr. LOCKWOOD said the imputation was that the Directors had not honestly carried on the operations of the Company; that they had not borne in mind the interests of the shareholders, but had worked to their own advantage and that of the promoters. The circular was published in the *Oracle;* and the following statement therein was the one complained of:

The Provisional Board now understand why the former Board obstructed rather than encouraged the practical development of the Company's undertakings. Their policy was not, as is clearly evidenced by extant documents, to earn fair profits by a regular course of legitimate working, but rather to organize a series of derivative companies, after the fashion of the Date Company and the Water-Gas Syndicate, and other cognate schemes, in the interests of promoters and directors rather than in those of investing shareholders. The interests of the Company have, beyond question, been grievously betrayed. The total cash share capital of the Company has never exceeded £5025, while the amount of the vendor's shares, in reality only about £12,000, was augmented by a group of promoters to no less than £38,000, thus leaving the cash-subscribing shareholders only a modicum of interest in the concern. The circumstances of the case, as disclosed in the report of the Committee of Investigation, and now further elucidated, are so exceedingly flagrant that the Board deemed it incumbent upon them to lose no time in instituting proceedings against the confederacy of Directors and promoters, with the object of getting a judicial rescission of the contracts and transactions by which the body of shareholders have been victimized.

From June, 1889, constant meetings of the Directors were held; one of the main objects being to establish in various districts subsidiary companies for carrying on the manufacture of gas under the patented process. This had many advantages, for the reason that those companies would pay to the parent concern one-third of their capital; and it was thought that the gas would have a much better chance of succeeding in a district provided with a central motive power. If the Company were selling to private individuals—say, in the Bristol district—it would be necessary, in the case of each individual purchaser, to set up for him an apparatus for the manufacture of the gas; but if, on the other hand, several districts were willing to combine, the advantage would be that a central motive power feeding the district could be provided. Whatever might be charged against the Directors, it could not be said that they did not give the best of their time and ability to the prosecution of the business. He was instructed to say that neither of the plaintiffs had received any fees in respect of the services they had rendered to the concern. Mr. Parker-Rhodes expressed unqualified approval of the formation of subsidiary undertakings. When, however, in October, 1889, it was resolved that the plant should be constructed by Mr. G. Bower, he for the first time objected; and having defeated the Directors, he carried a resolution to the effect that a Committee of Investigation should be appointed. In December, 1889, a Chancery action was commenced by Mr. Parker-Rhodes and Mr. Cantwell, on behalf of the shareholders, against the Directors and promoters, seeking to invalidate the contract for purchase of the patents, and asking for an account of the moneys paid. This action proceeded for some time; but in March, 1891, the plaintiffs were dismissed from the suit—it being admitted that they were not guilty of any fraudulent conduct, as Mr. Parker-Rhodes had written a letter exonerating them from participation in fraud. This, urged the learned Counsel, was all very well; but Mr. Parker-Rhodes should have thought of that before venturing, in December 1889, to send forth the libel of which complaint was now made. The plaintiffs courted the fullest investigation into their connection with the Company; they having made nothing out of it. They had, in fact, endeavoured to make the undertaking a success; and it was not their fault that it had been a failure.

Justice DENMAN asked if it was worth while to follow up the case against Mr. Parker-Rhodes; he having made a complete admission.

Mr. LOCKWOOD said the admission amounted to this—that if, in 1889, he called the plaintiffs scoundrels, he withdrew it in 1891. The plaintiffs were bound to bring the action.

Justice DENMAN asked whether, after the letter of March, 1891, it could be worth while to go on with the story as regarded the conduct of all the Directors.

Mr. LOCKWOOD said he was only appearing for Messrs. Keane and Greene, who were included in the sweeping allegation against the Directors.

Sir C. RUSSELL: Whose names were not mentioned at all.

Justice DENMAN: Where people are commenting on the conduct of a Board of Directors, they do not necessarily attack each individual, who may have been in the minority all the time.

Mr. LOCKWOOD said he should contend that each Director was attacked.

Justice DENMAN: Suppose an individual comes forward and says: "You attack a body of which I am one;" and the answer is: "I do not attack you—I except you. I do not believe there has been the slighest dishonesty on your part." Is it worth while to go on, and say "The cap fits me?" Is it of any use to go on with the action against Mr. Parker-Rhodes?

Mr. LOCKWOOD said he thought it was. As to the other defendants, the defence consisted mainly of privilege.

Justice DENMAN: They publish something which is an attack on the Board; but there is nothing to particularly fix it against the two plaintiffs, who are members of that body. Unless it is an attack against every individual member of the Board, you are in the same difficulty.

Mr. LOCKWOOD did not see how it could be for the public benefit that the Press should take up the cudgels and endeavour to procure a judgment at the bar of public opinion. The Press had no privilege in the matter at all, and had no right to comment on questions involved in an action where fraud was alleged.

Mr. *John Richard R. Keane* was then called, and examined by Mr. MONTEFIORE. He said he was a civil engineer, carrying on business at 2, Storey's Gate, Westminster; and he was one of the first Directors of the Lothammer Company, having been asked to join the Board by Mr. Moll. After investigating the matter, he came to the conclusion that the patent was a valuable one; and consequently he agreed to become a Director. Being much interested in the Australian colonies, he thought the invention would be of very great use there. The Directors set to work and opened up negotiations, with the object of forming subsidiary companies and earning profits by a regular course of legitimate working. The Company sold various sets of patents, the details of which would appear in the books. He denied that he was in league with the promoters; in fact, he did not know who they were. He had never made any profit out of the concern. The Directors always acted under the advice of the Company's solicitors. Mr. Parker-Rhodes first opposed the policy of the Board four months after the Company was formed. The Directors retired in a body after the presentation of the Investigation Committee's report. The Company was wound up on a petition presented by Mr. Parker-Rhodes. An action was brought against the former Directors and promoter for the rescission of the contract, and for an account of moneys paid; and it had been dismissed as against Mr. Greene and himself. The action was, however, being continued as against the other Directors.

Cross-examined by Sir C. RUSSELL: The libel of which complaint was made was contained in a letter or circular addressed by Mr. Parker-Rhodes, in his capacity as Chairman of the Provisional Board, to the shareholders of the Company. This letter appeared in the *Oracle* on Dec. 14, 1889, with the addition of the words: "The following circular has been addressed to the shareholders of the above Company." As a matter of fact, the name of neither of the plaintiffs was mentioned in the circular, which was a direct attack upon the policy of the Board. It was not by witness's direction that his solicitor served the writ on the United Printing and Publishing Company without sending any letter of complaint. The writ was issued on April 1, 1891, in respect of the publication of a letter on Dec. 14, 1889. The invention was described as being one for "the instantaneous production of light, heat, and motive power, the importance and commercial value of which it would be difficult to over-estimate;" and the capital of the Company was said to be £60,000. The prospectus stated that, by means of this invention, an immense economy was effected in the production of light, heat, and motive power. Its advantages were simplicity, purity, economy of installation, illuminating power, motive power, and adaptability. The prospectus further set forth that the system of lighting had been successfully tested by the Paris, Lyons, and Mediterranean Railway Company, as well as by other companies; but he could not say whether any of them were now using the patent. Mr. Prince, an expert, had given an opinion upon the validity of the patent; but witness had not seen it, nor could he produce it. He was told by Mr. Greene that an opinion had been obtained. The prospectus stated that it was estimated that the sale of the foreign patents would yield a sufficient profit to pay a bonus of 200 per cent. on the capital of the Company. This might be effected by sale outright or by forming separate companies to work the patents. Witness bought 100 shares in the month of October; but the provisional directorate would not allow the transfer to be registered. He bought the shares because of their cheapness. The transfer now produced, dated the 5th of November, was the one in question. He had acted as a Director, although he had not invested a farthing of his money in the concern. He had many times offered to take up his shares. He was aware that clause 96 of the Articles of Association provided that a Director must hold at least 100 shares in the Company; but the solicitor had told him that there was no necessity to qualify until within twelve months of the statutory meeting. Witness had never read the contracts referred to in the prospectus. Mr. Greene examined them; at least, witness arranged with him that, if he was convinced they were in order, this would satisfy witness. He had no recollection of the agreements being read in his presence. By the first agreement, Mr. Lothammer was to get, in meal or in malt, £40,000; the Directors having the option of paying part of the £38,000 in cash. This option, however, they did not exercise.

Sir C. RUSSELL: Would it have affected your judgment if you had known that, instead of Lothammer getting £40,000 "in meal or in malt," a great part of the sum was going to the promoters?

Witness: I know that, as a rule, there are promoters who have to get payment in some sort; and it is generally from the vendors.

Would it have affected your judgment in the matter as to the *bona fides* of the business, if you had known that, instead of Lothammer getting £40,000, a large proportion was going to the promoters?—It would not.

Would it have affected your judgment about the Company if you had known that some of it was going to the Directors?—Certainly.

Cross-examination continued: In the second agreement, Buttifant figured as the promoter; but witness did not know who was behind him. He had no idea who Buttifant or Blumfield was. He did not know that they were clerks in the Hamilton Syndicate, or that they were the promoters of the Company in connection with Mr. Moll and Mr. Dando. There was no reason why he should, before commencing the action, have taken steps to inquire the antecedents of these people. He did not know that Mr. Moll had been concerned in promoting the Moldacott Sewing-Machine Company, the Etienne Gas-Engine Company, the Whole-Meal Bread Company, or the Hamilton Syndicate, but he believed he was connected with the Metropolitan Coal Consumers' Association. He could not say whether or not any of these Companies were in existence now.

Sir C. RUSSELL: Would it be too much to say that a good many of them were shown to be swindles?

Witness: The only one that I know anything of which has "come to grief" is the Coal Consumers Association.

In further cross-examination, witness said he did not know that Colonel Murray was a friend of Mr. Dando; and he had not taken any steps to bring him to the Court. Colonel Murray, as a signatory to the Memorandum of Association, had one share, though afterwards he acquired 3000 shares, the consideration for which was 5s. It was explained by Colonel Murray that the shares were given to him as security by a Mr. Robbins, who owed him money; Mr. Robbins being one of the nominees of Mr. Lothammer. Mr. Greene was, like witness, waiting to take his qualification, as they had an idea of going more extensively into the Company. The other Director—Mr. Joselyne—did not hold any shares. Witness was a constant attendant at the Board meetings; but he could not say that he recollected the following letter, which was written to Mr. Smith, of Plymouth: "In reply to yours of the 7th of May, 1889, I have to state, for your information, first, that all the shares were not applied for; secondly, that the Directors, having obtained sufficient subscriptions to go to allotment, have made the allotment, and closed the list; thirdly, that applications for 25,000 shares had in consequence been refused, with letters of regret; that offers are under consideration for the sale of patent rights for upwards of £200,000, but as a shareholder, and one interested, you will understand that, pending completion of such arrangements, the Directors do not invite discussion on the subject publicly." At this time, only 5024 shares had been applied for by the public; and of the amount so received, £2000 in cash had to go to the vendor. The statement that the Directors had obtained sufficient subscriptions to go to allotment, had made the allotments, and closed the list, and that applications for 25,000 shares had in consequence been refused, was not for the purpose of whetting the appetite of the persons to whom it was addressed. He did not see any application for 25,000 shares; but the Secretary told him that it had been made. At subsequent Board meetings, shares were allotted to various persons. The Directors resolved that the first certificate should be numbered 20,001; that then the 38,000 vendor's shares should be numbered; and after that the shares allotted to the public. He did not see anything to object to in doing this.

Sir C. RUSSELL: As you are so innocent, let me suggest this to you: Would it not occur to an early applicant, if he found his shares marked with a very high number, that there had been a large application for shares by the public?

Witness: I do not see that it would have anything to do with it, as he would not get his certificate until a long time afterwards.

Can you suggest any honest reason for it?—I cannot suggest any reason at all. I do not see any dishonesty in it.

Justice DENMAN asked whether the object of the cross-examination was to show that the plaintiffs had been guilty of bad management.

Sir C. RUSSELL said that was his object.

Justice DENMAN suggested that the parties should consent to withdraw a juror.

Sir C. RUSSELL said, on the part of the defendants, he should contend that the conduct of the Directors had been of the most flagrant character; and as the affairs of the Company had been commented upon by almost every paper in London, it was very hard that his clients should be made to suffer.

Justice DENMAN said that, if the case went on, each party would incur very considerable costs.

Mr. LOCKWOOD asked for and obtained permission to confer with his clients.

While the conference was proceeding,

Justice DENMAN asked Mr. Parker-Rhodes if he was willing that a juror should be withdrawn.

Mr. PARKER-RHODES said he had been put to great inconvenience in the matter, and should rely upon the conduct of each member of the Board.

Justice DENMAN expressed his opinion that it would be a wise thing for all parties not to proceed further with the case.

Mr. PARKER-RHODES said he would leave the matter in the hands of Sir Charles Russell.

Mr. LOCKWOOD stated that, having conferred with his clients, he was willing to consent to the course proposed, upon the distinct understanding that all charges of fraud were withdrawn.

By consent, a juror was then withdrawn, and the case closed.

BANBRIDGE QUARTER SESSIONS.—Friday, Jan. 22.

(*Before Mr.* D. COLQUHOUN.)

Banbridge Gas Company v. Seapatrick Parish Select Vestry. The Supply of Gas to a Church and Schools.

This was a case in which the Banbridge Gas Company sued the Rev. C. T. P. Grierson and others, constituting the Select Vestry of Seapatrick, for £7 14s. 6d. for gas supplied to them for consumption in the parish church and schools up to July 1 last. The matter was argued at the previous Sessions; and his Honour now delivered judgment, in which the facts are set out.

Mr. D. WILSON appeared for the plaintiffs; Mr. W. H. BROWN represented the defendants.

His HONOUR said the action had been brought for the purpose of recovering from the defendants a sum of £7 14s. 6d. for gas supplied to the church and schools in the parish of Seapatrick. It appeared that for years past the plaintiffs had been in the habit of supplying gas to the church and schools, and of receiving payment therefor from the Treasurer of the Select Vestry, who, up to the 1st of April last, seems to have been Mr. Joy, one of the defendants. The gas account was supplied to the debt of "the church." No individuals were mentioned, either in their personal or their official capacity. Owing to some dispute among the congregation, at the annual election of Vestrymen, which took place on the above-named date, almost all, if not all, the old members were turned out, and their places filled by new ones. Mr. Joy ceased to be Treasurer; and he was replaced by Mr. Cunningham, one of the defendants. Mr. Joy had paid the gas account up to Jan. 1, 1891. The account for the quarter ending April 1, 1891, which amounted to £5 15s. 9d., was not paid by Mr. Joy before going out of office, because, after reimbursing himself for certain sums which he was out of pocket in his capacity as Treasurer, he had no funds available for the purpose. The plaintiffs, after the 1st of July, furnished to the defendants, as then constituting the Select Vestry of the parish, the account for the two quarters from Jan. 1 to July 1, 1891, amounting to £7 14s. 6d., the sum sued for. The defendants admitted their liability to pay for the gas supplied to the church during the quarter from the 1st of April to the 1st of July; and they tendered £1 15s. on that account. The actual consumption in both the church and the schools during this period was £1 18s. 9d.; but the defendants denied that any liability attached to them in this respect. The whole case resolved itself into a struggle as to whether the defendants were liable in law to pay for the gas supplied to the church up to the 1st of April, and while the old Select Vestry were in office. Mr. Brown contended that the plaintiffs were restricted to the remedies given to them by the Gas-Works Clauses Act. He (his Honour) passed this contention with the observation that, in his opinion, it was not well founded, and came to the real point at issue. By the 20th section of the Church Act, 1869, the members of a church are bound by the constitution and laws for the time being in force, in the same way as if they had mutually entered into a contract to this effect. Section 20 of cap. 3 of the statutes of the General Synod of 1879 provided that, subject to any regulations of the Diocesan Synod, the Select Vestry were to have control of the church funds, and provide all requisites for Divine service. This would clearly include gas or other artificial light. The incoming Vestry in the present case allege that they did not receive any funds from their predecessors on taking office; and therefore were not bound to pay a debt previously contracted. On the other hand, it was alleged that the new Vestry, since entering into office, had received all the church funds, which were much more than sufficient to pay this gas account. The incoming Vestry must be taken to have assumed office with all the obligations to it; and it was for them to ascertain what these obligations were. Moreover, it appeared from the parish account ending March 1, 1891, that there was then only a sum of 5s. in the Treasurer's hands; and although, during his fourth additional month of office, Mr. Joy received more monies, yet he seemed to have expended them for church purposes before going out of office. It might therefore well be that, having regard to the organization of the church and the practice which appeared to have prevailed in the parish, an implied contract at least would exist on the part of the incoming Vestry to indemnify the outgoing one in respect of any debt properly incurred by the latter for the purpose of Divine service. The plaintiffs were no parties to the contract incident to the membership of the church, created by the 20th section of the Act. They were complete strangers to it; and, in his opinion, the case must be decided outside the section, and any of the rules or regulations of the church springing from it. The plaintiffs must certainly succeed on some contract, either expressed or implied, whereby the defendants—not in any official or representative capacity, but as individuals—were jointly liable to pay for the gas consumed in the church between Jan. 1 and April 1, 1891. Where was such a contract between the plaintiffs and the defendants to be found? Where was the contract between them and the plaintiffs to pay the debt for gas supplied while the old Vestry was in office? Mr. Wilson's argument, on behalf of the plaintiffs, was to the effect that the old Vestry were liable on a contract between them and the plaintiffs to pay for this gas; that the new Vestry, on coming into office, assumed this liability; and that, by some legal legerdemain, the contract was transferred from the old to the new Vestry, so as to enable the plaintiffs to sue on it. It was well-settled law that a new partner coming into a firm could not be sued by a creditor of the firm on a contract entered into before the new partner joined, even though he became entitled to his share of the property and profits, including the benefit of the contract in question, [His Honour cited a number of cases in support of his views. Supposing that, instead of the gas having, as in this case, been furnished to a church, it had been supplied to a trading concern in which the defendants became partners after such supply, it was clear that they could not be sued by the plaintiffs. The present case seemed to him to be much stronger in the defendants' favour than any he had cited; and he felt reluctantly coerced, both on principle and authority, to dismiss the case.

The Swinton Gas Bill and the Supply of Eccles.—A letter appeared in the Manchester papers recently, from a correspondent residing at Eccles, in which the attention of the Local Board was called to two or three provisions in the Bill of the Swinton Local Board, in order that they may consider whether or not it is desirable to oppose the scheme. The writer says that the gas consumers of Eccles now complain of gas which has an illuminating power of nearly 19 candles; while Swinton proposes to supply gas of only 14-candle power. This will mean a loss of 25 per cent. in light; or if extra burners are used to procure the same amount of light as at present, it will represent an increase of 33 per cent. in the quarterly gas accounts. In the second place, the consumers now object to the enormous profit alleged to be made by the Salford Corporation; and the Eccles Local Board have endeavoured to induce them to be content with 10 per cent. The Swinton Bill, however, specifically provides that the provisions of the Gas-Works Clauses Act, 1847, with respect to the amount of profit to be received, shall not apply to their scheme. The consumers also think that the Salford Corporation are charging too much when the price of the gas is 2s. 8d. per 1000 cubic feet. The Swinton Bill, the writer points out, fixes the maximum price at 4s. per 1000 feet; but if the promoters are as disinterested as they profess to be, the maximum price, he contends, should be 2s. 6d. With regard to the differential rate, the gas consumers, continues the letter, entertain a strong opinion about it, and it was made the main point in the opposition of the Eccles Local Board to Salford twelve months ago. Nothing is mentioned in the Swinton scheme about a differential rate to Eccles, Barton, and Worsley, &c.; but it is said as a fact that they intend to charge a very large differential rate, in order that their own ratepayers may receive gas at a reasonable or even very low price.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Directors' Half-Yearly Report.

The following report, with the accounts showing the working of this Company during the six months ending Dec. 31 last (given on the opposite page), will be submitted to the proprietors at the half-yearly general meeting on Friday next :—

The half-year's accounts to the 31st of December last, herewith submitted, show that, after providing for all fixed charges, a balance of profit amounting to £206,876 5s. 6d. remains applicable to dividend on the ordinary stock of the Company. The statutory rate of dividend for the half year, the price being 2s. 9d. per 1000 cubic feet, would be 13 per cent., which would require £148,727 0s. 6d. to be taken from the reserve fund. Having regard to the desirability of not unduly reducing the reserve, the Directors recommend that 12 per cent., instead of 13 per cent., should be divided, which will require £121,372 18s. 6d. to be taken from the reserve; leaving a balance of £115,244 1s. 5d.

In view of the continued deficiency in profit required to meet the authorized dividend involving the absorption of so large a portion of the reserve fund, the Directors have increased the price of gas for the current year from 2s. 9d. to 3s. 1d. per 1000 cubic feet for common gas, with a corresponding increase in the price for cannel gas. This rise in price will, under the sliding scale, involve a reduction of 1 per cent. in the standard rate of dividend—that is, from 13 to 12 per cent. This step is taken in the belief that it is necessary to maintain the margin of profit required to pay the statutory dividend without, if possible, further trenching upon the reserve fund.

In the half year ending Dec. 31, 1890, the increase shown in the sale of gas was 5·16 per cent.; and in the first half year of 1891, 9·55 per cent.—an average of 7·35 per cent. for the two half years. The dark, cold, and foggy winter of 1890-91 produced this abnormal increase. During the past half year, the weather, with the exception of the last two weeks in December, has been much milder; and a decrease of 1·74 per cent. in the sale of gas is the natural consequence. The same cause, coupled with a stagnant condition of the cement and chemical industries, has considerably reduced the receipts from coke and other residuals. The increase in gas sold in the June half year of 1891 was, as stated above, 9·55 per cent.; so that, in spite of the reduction of 1·74 per cent. last half year, the absolute increase for the whole year is 3·76 per cent.; the average increase for the past twelve years being 3·43 per cent. The increase in the number of consumers also maintains the same average rate, and for last half year amounted to 2565; bringing the total number up to 200,577.

Coal cost less in the past half year than in the corresponding half year of 1890; and the Directors look for a further reduction in price. But its quality and condition as delivered have been much inferior; owing, it is asserted, to difficulties with the miners.

The fog which a few days before Christmas suddenly enveloped London was, in density and duration, more serious than any yet experienced. The quantity of gas sent out by the Company during the 24 hours ending at six o'clock in the morning of the 23rd of December was 128 million cubic feet—the highest figure ever reached, and involving the carbonizing of about 13,000 tons of coal; and this figure would have been materially increased if the Company had had further manufacturing power. The resources of the Company were very severely taxed to meet this great and sudden demand, which points to the necessity of making considerable additions to the carbonizing plant.

The appeal for the reduction of the rateable value of the Company's property, at the quinquennial re-assessment, was heard at great length, and concluded in December; and judgment is now awaited.

The question of standard tests for illuminating power has been submitted to the consideration of a Scientific Committee appointed by the Board of Trade; and it is hoped that the use of some uniform testing apparatus may be arrived at, and a simplification of the present standard of light may be devised which will be equitable as between the Companies and the consumers.

The Engineers of the several manufacturing and distributing departments have certified to the Court of Directors that all the plant of the Company under their charge respectively has been maintained in full efficiency during the past half year.

Following the report is the statement of accounts. As usual, we merely indicate the alterations that have taken place in those portions which are not subject to much variation; reproducing the remainder in full.

Nos. 1 and 2 are the statements of stock, share, and loan capital, the totals of which on Dec. 31 last were as follows: Stock and share capital, £8,579,000; loan capital, £2,444,000. These amounts stand as on June 30 last.

No. 3 is the capital account, the receipts on which are also as on June 30—viz., £11,795,400. The expenditure is shown in the following items :—

Expenditure to June 30, 1891			£10,808,619 0 3
Expenditure during the half year to Dec. 31, 1891, viz. :—			
Lands acquired, including law charges	£7,076 17 9		
Buildings and machinery in extension of works	159,376 13 10		
New and additional mains and service-pipes	7,455 13 11		
Do. do. meters	7,174 13 5		
Do. do. stoves	8,520 17 11		
	£189,604 16 10		
Cr. By depreciation of meters	£4,150 0 0		
Do. do. stoves	6,205 0 0		
	10,175 0 0		
		179,429 16 10	
		£10,988,048 17 1	
Balance of capital account		807,351 2 11	
		£11,795,400 0 0	

Nos. 4 and 5 are the revenue and net revenue accounts. These are given in full on the opposite page.

No. 6 is a statement showing how the Directors propose to appropriate the balance applicable for dividend. It is as follows :—

Dec., 1890.			
£7,393 ..	Net balance brought from last account	—	
202,502 ..	Net revenue for the half year	£206,876 5 6	
145,696 ..	Amount to be withdrawn from the reserve fund	121,372 18 6	
			£328,249 4 0
£355,591 (13 per cent.)	A dividend on the ordinary stock—		
£355,591 ..	12 per cent. on £5,470,820	—	328,249 4 0

Nos. 7 and 8 are the reserve and insurance fund accounts. The former shows that the balance of the reserve fund on June 30 last was £391,914 6s. 6d., which was increased to £396,462 5s. 1d. by the addition of £4547 18s. 7d., interest on the sum invested. The amount carried to the net revenue account was £159,845 5s. 2d.; so that the balance at the end of the year was £236,616 19s. 11d. The insurance fund stood at £87,130 9s. 10d. on June 30 last; it amounted to £88,322 3s. 8d. at the end of the year.

No. 9 is the depreciation fund account. It stood at £39,162 18s. 9d. at the close of the June half year; and on Dec. 31 it had been raised to £39,750 7s. 7d. by the addition of £587 8s. 10d. received as interest.

Nos. 10 and 11 are as follows; and Nos. 12 and 13 are given on the opposite page.

No. 10.—STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, June 30, 1891.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, Dec. 31, 1891.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . .	187,840	1,062,623	950,661	1,856	297,946
Cannel . . .	12,812	31,198	23,288*	—	20,722
Total . .	200,652	1,093,821	973,949	1,856	318,668

* In addition to this quantity, oil, equivalent of 14,631 tons of cannel, has been used during the half year.

No. 11.—STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, June 30, 1891.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, Dec. 31, 1891.
Coke—tons	40,419	599,832	158,351	430,361	51,539
Breeze—tons.	9,708	59,563	21,620	41,987	5,664
Tar—gallons	554,107	10,224,998	9,908,398	27,915	842,792
Ammoniacal liquor—butts	14,719	265,402	249,573	9,044	21,504

The Position of the Company—Suggested Committee of Investigation.

The following article, dealing with the position of the Company, and suggesting the appointment of a Committee of Investigation, appeared in *Money* last Saturday :—

The Gaslight and Coke Company has announced a dividend on its ordinary stock of 12 per cent. for the past half year, against the 13 per cent., and even higher dividends, it has paid for so long a time. Our readers doubtless know that for the past three or four half years the Company has been able to keep up its dividend only by drawing upon its reserve fund. Now that fund has been so much reduced that the Board shrink from drawing further upon it; and so the practice of paying dividends which have not been earned is given up, and the rate of dividend is reduced. Naturally there is much grumbling amongst the shareholders; but the general public too—the customers, that is to say, as distinct from the shareholders of the Company—have also a very material interest in the matter. It will be in the recollection of our readers that within the past nine months or so the price of gas has been raised 7d. per 1000 cubic feet, or 25 per cent. Now, 25 per cent. in so short a time is an enormous increase in the cost of gas. It means the extraction from the pockets of the people of London of about £600,000 per annum; and the people of London have a right to ask why so great an addition is made to the cost of what is now a necessary of their existence. If the dividends had been increased, the action of the Board would at all events be intelligible. In that case the general public would be taxed to enrich the shareholders; and there would be ample justification for the strictures that are so freely made about the Gas Company. Fortunately, however, the provisions of the sliding scale render it imperative that any increase in dividend must be accompanied by a *reduction* in the price of gas. But that the people of London should be required to pay 25 per cent. more for their gas than they were paying a year ago, and that at the same time the shareholders' income should be cut down from 13 per cent. to 12 per cent., or nearly 8 per cent., is a state of things which calls loudly for explanation. It is said, on behalf of the Board, that the price of coal has been high for several years. No doubt that is so. The coal trade was the first that felt the influence of the wild speculation in South America, which was one of the main causes of the recent prosperity of trade. The miners took advantage of the great demand for coal to insist upon rises of wages again and again; so that in a comparatively short time miners' wages were raised from 25 to 30 per cent. Further, it is alleged that since the dock strike wages of all kinds in London have been raised very greatly; that the Company has, in consequence, had to pay very much more money for labour; and that increased cost of coal, together with the rise in wages, accounts for the difficulties in which the Board finds itself.

Unfortunately for this explanation, The Gaslight and Coke Company is not the only one that serves London. The Commercial, the South Metropolitan, and the Brentford have at least equal difficulties to contend against; and yet they have not had to raise the price of gas and to lower their rates of dividend to anything like a proportionate extent. They buy their coal, presumably, in the same market; at all events, the same market is open to The Gaslight and Coke Company which is open to them. They sell their residual products, presumably, also in the same markets; and they draw their employees from the same classes and the same districts. How is it that they have not suffered

ACCOUNTS OF THE GASLIGHT AND COKE COMPANY FOR THE HALF YEAR ENDING DEC. 31, 1891.

No. 4.—REVENUE ACCOUNT.

Dr.

December Half Year, 1890.		£ s. d.	£ s. d.	December Half Year, 1890.
	To Manufacture of gas—			
£788,990	Coals, including oil, dues, carriage, unloading and trimming (see Account No. 10)	722,757 9 8		£1,193,150
10,109	Salaries of Engineers and other Officers at works	9,879 7 2		44,682
180,825	Wages (carbonizing)	172,076 13 8		69,290
41,802	Purification, including £18,332/14/6 for labour	38,482 2 10		2,680
				£1,309,802
178,737	Repair and maintenance of works and plant, materials and labour, less received for old materials, £1924 18s. 1d.	160,591 19 0		27,585 6,229
			1,103,787 12 4	
	Distribution of gas—			277,054
23,013	Salaries and wages of Officers (including Rental Clerks)	23,671 3 8		7,490 116,160
27,994	Repair and maintenance of mains and service-pipes	28,684 16 11		65,228
16,773	Repair and renewals of meters	20,334 19 4		
22,882	Stove fixing, repairs, and renewals	20,824 9 0		3,660
			93,515 8 11	192
	Public lamps—			300
16,093	Lighting and repairing	16,435 11 6		
189	Experimental street lighting	141 6 0		
			16,576 17 6	
	Rents, rates, and taxes—			
3,388	Rents payable	3,177 1 9		
77,092	Rates and taxes	79,371 18 1		
			82,548 19 10	
	Management—			
2,750	Directors' allowance	2,750 0 0		
200	Company's Auditors	200 0 0		
7,972	Salaries of Secretary, Accountant, and Clerks	8,543 15 6		
14,676	Collectors' commission	14,678 1 0		
4,605	Stationery and printing	3,512 11 7		
1,619	General charges	1,835 5 0		
			31,519 13 1	
536	Parliamentary charges	..	311 8 4	
3,538	Law charges (including Surveyors' charges *re* Quinquennial Valuation)	..	2,952 6 4	
6,349	Bad debts	..	7,817 12 6	
750	Depreciation fund, for works on lease-hold land	..	..	
9,624	Annuities	..	10,217 8 3	
	Public Officers—			
849	Gas Referees and Official Auditor	851 1 2		
1,100	Public testing-stations	1,032 5 3	1,883 6 5	
£1,442,445			1,351,160 13 6	
371,550	Balance carried to net revenue account, No. 5		393,301 11 0	
£1,813,995			1,744,462 4 6	£1,813,995

Cr.

	£ s. d.	£ s. d.
By Sale of gas—		
Common gas, per meter, at 2s. 9d. and 2s. 3d. per 1000 cubic feet	1,186,214 5 11	
Cannel gas, per meter, at 3s. 5d. per 1000 cubic feet	39,438 18 9	
Public lighting and under contracts—		
Common gas	70,694 6 6	
Cannel gas	2,676 16 7	
(See Statement No. 12.)		1,299,026 7 9
Rental of meters	..	28,372 0 0
Rental of stoves	..	7,829 13 10
Residual products—		
Coke, less £39,079 17s. 1d. for labour, &c.	231,697 8 11	
Breeze, less £2968 8s. for ditto	5,271 2 8	
Tar and tar products	103,712 8 1	
Ammoniacal liquor and sulphate of ammonia	63,795 7 1	
		404,476 6 9
Rents receivable		4,248 3 8
Transfer fees		209 12 6
Canteen account		500 0 0
		1,744,462 4 6

No. 5.—NET REVENUE ACCOUNT.

Dr.

December Half Year, 1890.		£ s. d.	£ s. d.	December Half Year, 1890.
	To Interest on debenture stocks and bonds, accrued to Dec 31, 1891	..	62,659 12 6	£362,983
63,279	Dividend on the preference stocks	74,034 10 0		..
47,500	Dividend on the maximum stocks	47,500 0 0		355,590
			121,534 10 0	£7,393
4,819	Interest on temporary loans and sundry funds		2,231 3 0	6,193
209,895	Balance applicable to the payment of dividend on the ordinary stock		206,876 5 6	371,550
£385,196			393,301 11 0	£385,136

Cr.

	£ s. d.	£ s. d.
By Balance from last account	195,746 6 10	
„ Amount withdrawn from Reserve Fund	159,845 5 2	
Less dividend on the ordinary capital for the half year to June 30, 1891	..	355,591 12 0
		355,591 12 0
		..
„ The South Metropolitan Gas Company	..	..
„ Revenue account (No. 4)	..	393,301 11 0
		393,301 11 0

No. 12.—STATEMENT OF GAS MADE, SOLD, Etc.

Description of Gas.	Quantity Made.	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights (per Meter).	Quantity Sold. Total Quantity Sold.	Quantity used on Works, &c.	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	9,655,618	503,867	8,593,482	9,097,349	129,934	9,227,283	428,335	49,494
Cannel	262,007	16,682	228,555	245,237	2,079	247,316	14,691	2,185
Total	9,917,625	520,549	8,822,037	9,342,586	133,013	9,474,599	443,026	51,679
December half year, 1890	10,102,092	510,373	8,997,480	9,507,853	125,667	9,633,520	468,572	50,946

No. 13.—GENERAL BALANCE-SHEET.

Dr.

December Half Year 1890.		£ s. d.	£ s. d.	December Half Year 1890.
£	To Capital—			£
729,498	Balance at credit thereof	..	807,351 2 11	114,346
	Net Revenue—			..
209,895	Balance at credit thereof	..	203,876 5 6	
	Reserve Fund—			Amount invested—
531,395	Balance at credit thereof	296,616 19 11		2¾ per Ct. Consolidated Stock . . £328,421 15 9
	Insurance Fund—			
85,962	Balance at credit thereof	88,322 3 8		
			324,939 3 7	
	Depreciation Fund—			274,651
38,558	Balance at credit thereof	..	39,750 7 7	21,526
	Interest on debenture stocks and bonds,			
59,543	due on Dec. 31, 1891	..	62,659 12 6	101,939
	Preference and maximum dividends			173,008
110,779	due on Dec. 31, 1891	..	121,534 10 0	
	Unclaimed dividends due on Dec. 31,			
10,671	1891	..	10,670 18 6	
	Sundry tradesmen and others, for			917,396
	amount due for coals, stores, and			18,654
344,357	sundries	..	311,773 12 6	
1,667	Benevolent Fund	..	1,667 6 8	63,193
200,000	Temporary Loan	..	100,000 0 0	4,233
2,322,445			1,987,222 19 9	2,322,445

Cr.

	£ s. d.	£ s. d.
By Cash at Bankers	..	95,797 2 9
Amount invested—		
2¾ per Ct. Consolidated Stock . . £328,421 15 9	..	324,939 3 7
Stores on hand, viz.—		
Coals	235,081 5 4	
Coke	21,830 10 0	
Tar and ammoniacal liquor and products	94,640 0 10	
Sundry stores	244,503 5 9	
		596,055 1 11
Accounts due to the Company, viz.—		
Gas and meter rental—		
Quarter ending Dec. 31, 1891	898,769 9 1	
Arrears outstanding	14,350 12 1	
		913,120 1 2
Coke and other residual products	37,011 4 5	
Sundry accounts	20,300 6 0	
		57,311 10 5
		1,987,222 19 9

from the rise in the price of coal and the advance in wages as The Gaslight and Coke Company has?

We have put the case of the latter Company too favourably; it, in fact, has very great advantages over the three others. It serves by far the largest part of the Metropolis, and, what is not less important, by far the richest part. It does business on a scale so immense that it ought to be able to practise economies which should not be within the reach of the smaller Companies; and it ought, furthermore, to be able to push business far more actively than they. Yet, as we see, it has suffered much more than they have. Our contemporary the JOURNAL OF GAS LIGHTING suggests that there is mismanagement; and we greatly fear that that is the only answer which will solve the problem before us. At all events, there is a very strong *primâ facie* case to support the charge that there must be mismanagement. In addition to what we have already cited, our contemporary says: "It is notorious that there have been shifts and changes among the head-quarters and distributed staffs; and there is a notion abroad that these changes indicate the existence of grave troubles in and about the organization." The charge having been made, and being supported by such an array of facts, it is of the first importance that it should be quickly probed to the bottom. Measures should be taken to secure the appointment, without a moment's delay, of a Committee of Inquiry.

We do not take upon ourselves to say that there is mismanagement; we are merely pointing out what lends countenance to the charge that has been made. And certainly no one will accuse us of hostility to the Company. Persistently we have supported it; and at last we are brought to the conclusion at which we have arrived very unwillingly. We are satisfied, however, that silence, under the circumstances, would be the unwisest policy in the interests of the Company. What is wanted is a change, if there is mismanagement; and if there is not, an assurance that will satisfy the shareholders and the investing public generally that there is no good ground for the allegations that have been made. There is only one way in which that assurance can be given; and it is by means of a competent Committee of Investigation. The Committee, we need hardly add, ought to consist of substantial shareholders in the Company, and likewise they should be men who will give the necessary time and labour to make the inquiry exhaustive, and in whose good faith the shareholders generally can trust. In short, the Committee should consist of men of the stamp of Mr. Livesey, of the South Metropolitan Company—men of business and men of integrity—at that time of life when they are capable of doing good and efficient work. The Committee, too, should not be too large (half-a-dozen would be quite enough—if it is too large it will do little or nothing); and, when once it is appointed, it should be given a free hand. The fullest authority should be extended to it to probe the whole matter to the bottom.

But if a Committee of the kind is to be secured—and we do not hesitate to say that it is imperatively required—the younger shareholders must sacrifice a little time and attend the meetings. Everyone who has been in the habit of attending the meetings of The Gaslight and Coke Company knows that nothing is to be expected from those who in the past have constituted the great bulk of the audience. Doubtless they were once upon a time good men of business; but now they are mere fossils. They have long passed the age when they were capable of efficient work; and they would be much more in place at home by the fireside, well wrapped up, and taking precautions against the influenza epidemic, than attending a meeting of a great Company. What usually takes place at these meetings is this: The Board is arranged at a raised table in a long line, with a number of officials behind them ready to prompt them if an unexpected question is suddenly put before them. The meeting sits in the form of an horseshoe; and the old gentlemen who constitute practically the bulk of it are most anxious to get as near as possible to the Chairman, so as to be able to hear what he says. It is painful to see how they crane their necks and form a kind of trumpet of their hands, in the hope of catching what their deafness prevents them from hearing properly; and if one of them is moved to speak, the cracked and weak voice shows how completely he has passed his working time. Now, it is evident that from a meeting of this kind determined opposition is not to be expected. The Chairman, with his usual crispness and amiable smile, will nimbly and blandly express his regret that the Board has not been able to earn the full rate of dividend; and will dismiss the matter with the usual reference to the hugeness of the operations conducted by the Company, and the hope that things will soon mend. But he will have little fear of anything that may be proposed by the antiquated fossils before him. We would therefore appeal to the younger shareholders to bestir themselves, to attend the meetings, and insist upon the necessary Committee. They ought, of course, to determine beforehand who are to constitute the Committee, and be prepared for other probable contingencies. If Mr. Livesey could be induced to lead the movement, he would be the fittest. But probably, for reasons that will be easily understood, he will not agree to take so pronounced a position. There must, however, be quite enough young men amongst the shareholders who are willing to take action; and if they take action, Mr. Livesey and other competent persons can easily be induced to form the Committee.

Failure of the Electric Light in Santa Fe.—The electric light has proved to be a failure in Santa Fé; and the Municipality have returned to the use of kerosene for the public lighting.

The Supply of Water for Fires in the Metropolis.—In the annual report of the Chief Officer of the Metropolitan Fire Brigade (Captain Sexton Simonds), he states that the quantity of water used to extinguish fires in the Metropolis during the past year was nearly 19 million gallons, or about 84,000 tons. Of this quantity about one-third was taken from the river, canals, and docks, and the remainder from the mains. During the year there were five cases of short supply of water, eight of late attendance of turncocks, and three of no attendance. Captain Simonds remarks that, as long as the supply of water is intermittent in some parts of the Metropolis, difficulties must occasionally arise. But each year the area under constant service is increasing; and the cases in which the water arrangements are unsatisfactory point to a proportionate decrease.

ASSOCIATION OF SULPHATE OF AMMONIA MANUFACTURERS.

The following are some extracts from the report of the Council of the above Association, which was read at the annual general meeting of members, recently held in Manchester, under the presidency of Mr. Joseph Hepworth, M. Inst. C. E., Gas and Water Engineer of the Carlisle Corporation:—

There was some hope, when the Association was formed in November, 1885, that prices would never recede to the figures of that month, though £10 5s f.o.b. Hull was the lowest point touched in December of that year. By March of 1886, prices had risen considerably—£14 10s. being touched by the 24th of the month; and the members began to congratulate themselves that the Association was doing some good.

There is no doubt that much of the improvement must be attributed to the formation of the Association. The weekly circular, giving the market reports from London, the Provinces, and Scotland, was a new thing, and was carefully studied by the recipients. A study of it revealed the fact that the periodical cry of "no foreign orders," "no demand," was untrue, and was only used by speculators to depress values, in order to enable them to cover sales previously made at low prices. By careful attention to the figures contained in the weekly reports, an improved value was brought about, and the 96 members forming the Association became centres of information of great value to the whole trade. Of course, there were, and always have been, many manufacturers of sulphate of ammonia unwilling to join the Association—believing, as they say, in absolute freedom in all trade matters; and this outside element has always been a source of weakness to the Association.

The sulphate market can scarcely be in a much worse position than it is at present, for those to whom the intrinsic value of gas liquor is everything. It will readily be seen that those who may be purchasing gas liquor on the sliding-scale basis have not the same interest in maintaining sulphate at a decent value as those who produce the liquor; and, further, most of the sliding-scale contracts were made at a time when sulphate was much higher in price than it is to-day, and a value approximating to £10, especially under £10, was scarcely dreamt of, and not adequately provided for.

In some cases, under the sliding-scale arrangement, it may pay the contractor better at £10 than at £14. He has less capital locked up in his business; and probably he has reckoned on a greater margin of profit at the lower price. In face of such a state of affairs, your Council can only call attention to these facts as one of the causes of low sulphate values, leaving those who have liquor to sell to apply the necessary remedy. It has never been an object of this Association to compel makers to sell at any given price. Perfect freedom has been the chief point in the conduct of the business of the Association; your Council believing in the policy of disseminating sufficient information to enable manufacturers to obtain a thorough grasp of the situation, and to act according to the best of their judgment. Your Council is now of an opinion that the time has arrived to make an effort to persuade all those manufacturers who have not before seen their way to join the Association, to do so; being convinced that such a step accomplished would be for the benefit of the whole trade.

Your Council has been seriously exercised by the recent fall in sulphate values, and has come to the conclusion that much good may be done by a quarterly meeting of the members in London, and has determined to try the experiment during 1892. It will give producers an opportunity of meeting and talking over trade matters in the same way as iron-trade matters are talked over; and some good will perchance come from such gatherings.

The Association has now been in existence for six years; it will therefore be interesting to give a short history of what has been done in that time. It commenced its first general meeting with a roll of 96 members. Since that time a few have resigned and others have joined; making the list to-day as 83, with an annual make of over 50,000 tons of sulphate. During the first year of the Association's existence, the work done was mainly that of disseminating market reports and the weekly shipments of sulphate from the five principal ports of the United Kingdom. Your Council had many meetings. But, the members of Council being situated at great distances from London, the attendances gradually fell off; and as sulphate had improved considerably, there did not seem to be that necessity for meeting there does now.

At this time there was a feeling in favour of offering a prize of £1000 for a treatise on the use of sulphate of ammonia as a manure; and upwards of £300 was promised in contributions. But your Council was not satisfied that £1000 so spent would be well laid out, and the project was abandoned. Another project was to offer money prizes at various agricultural shows for crops grown with sulphate of ammonia, to the exclusion of other nitrogenous substances; and your Council believes that such a course, if adopted now, would lead to a very largely increased consumption.

Believing in the efficacy of stimulating home consumption, your Council issued at cost price to members during 1886 no less than 80,000 handbills, which were circulated in their immediate neighbourhood by the various members ordering them. Your Council had every reason to believe that this handbill had produced good results; and they instructed the Honorary Secretary [Mr. G. E. Davis] to prepare some reliable information on the use of sulphate in pamphlet form. This was done, and issued in 1887; several thousands being distributed. Another call was made for the pamphlet in 1888; and this led to the production of another form. It may be interesting to inquire how the circulation of this handbook has affected home consumption. It is difficult to say exactly, as many elements have to be taken into consideration; but the fact may be noted that home consumption, which was nominally 20,000 tons in 1885, had risen to 40,000 tons in 1889. Home consumption should be a very important item in the sulphate trade; and your Council is very strongly of opinion that the judicious offering of prizes for crops grown by its aid would prove a good investment.

In 1886, statistics were collected from upwards of 60 works as to

the relative quantity of sulphate made in each of the four quarters of the year, which were as follows:—

January, February, March	34 per cent.
April, May, June	17 ,,
July, August, September	13 ,,
October, November, December	36 ,,

In the report for the second quarter of 1886, the expenses for making a ton of sulphate were given as shown in the second column below:—

	Old Stills. £ s. d.	Column Stills. £ s. d.
Oil of vitriol	2 0 0	2 0 0
Fuel	0 7 6	0 3 6
Lime	0 3 6	0 1 6
Bags	0 4 6	0 3 4
Labour	0 8 0	0 3 6
Packing	0 1 0	0 0 10
Cartage	0 1 0	0 1 0
Broker's discounts	0 12 6	0 7 0
Carriage and f.o.b. charges	0 12 6	0 11 6
	4 10 0	3 12 2

The old stills have in many instances been replaced by column stills, which, working more economically than the old form, have perhaps lessened the loss to which manufacturers would otherwise have been subjected. The figures forming the third column will probably hold good for such places as Manchester for the new system of working. It will also be noticed that a difference in the shipping charges occurs in the two columns. Owing to the action taken by the Council, Messrs. T. Wilson, Sons, and Co. reduced their shipping charges from 1s. 9d. to 9d. per ton; or, in other words, put £1100 per annum into the pockets of the sulphate manufacturers.

During this year considerable discussion took place upon a project for placing money prizes at the disposal of the various Agricultural Societies throughout the country for crops grown with sulphate of ammonia; but the lack of necessary funds caused the matter to remain in abeyance. At the end of 1886 there was a balance due to the Honorary Secretary of £20 12s. 1d., which by the next year was turned to a credit balance of £17 14s. During 1887 the weekly circular was continued. The annual general meeting held at the Cannon Street Hotel was very thinly attended. During the year the Council had under consideration again the subject of a prize essay; but as it seemed that the Association's handbook was accomplishing the object sought, there was no necessity for further pursuing the matter. At this time the Council had many discussions on the advisability of endeavouring to sell sulphate according to its percentage of ammonia, with a 24 per cent. minimum.

The next annual meeting was held in Manchester, at which the balance in hand was declared to be £41 14s. 3d. During this year the Council had been considering the advisability of some uniform contract note for selling sulphate. A Sub-Committee was appointed, and many different forms were collected and examined; and the outcome was an Association contract note, which the members were asked to use.

During the year the weekly circular was regularly issued, and gave prices at which actual sales were being made at the chief ports of the United Kingdom. The annual report gave a summary of exports during the years 1886, 1887, and 1888, and a comparative table of prices. In 1889 the Railway Rates Committee were at their labours; and your Council used their endeavours to get the carriage of gas water in owners' tank waggons put upon a more equitable basis. After some correspondence with the Board of Trade and the Railway Companies, your Council were successful; and the carriage of gas liquor in owners' tank waggons was placed in a class lower than it would otherwise have been.

At the end of 1889 the credit balance stood at £85 3s. 4d.; and at the end of 1890 it was further increased to £99 2s. 6d. During 1889 the weekly circular was regularly continued as usual. Your Council wishing to see some uniform contract note adopted by the members, following the instructions from the annual meeting, sent each member a copy of the note already alluded to, recommending its adoption for sales of sulphate whenever possible.

Your Council had also under consideration several letters with respect to the charge for still licences, which the members generally considered was illegal. It was decided to take Counsel's opinion as to whether the Inland Revenue Act of 9 & 10 Vict. could be reasonably construed to mean and include ammonia stills.

Early this year one of the Supervisors of Excise sued one of the members of the Association (Mr. T. Illingworth) for penalty for using a still without a licence. The case was heard in the Halifax Police Court, when the Magistrates dismissed the charge on the ground that they were of opinion that the sulphate still was not within the meaning of the Act. The Supervisor appealed against the Magistrates' decision; and your Council agreed to make Mr. Illingworth an allowance from its funds towards his expenses. In the meantime, however, Mr. Illingworth died. When the appeal came on in London, the Judge decided that the matter was personal to the late Mr. Illingworth, and that the issue could not lie upon his successor; so the appeal was dismissed, and the matter is still in need of a final settlement. Your Council is now in communication with The Gas Institute upon the subject, with a view to co-operation in the matter, intending, if possible, to aid in defending the next prosecution of its members, to make it a test case, and to carry it to the Appeal Court if necessary, as your Council considers that the action of the Supervisors of Excise is a straining of the law never contemplated by the Act, harassing to trade, and perhaps illegal.

Your Council considers that, though the Association has not succeeded in holding up prices during the present year (1891), it has not been idle; and its labours as set forth must have been of benefit to the trade. It now remains to be seen whether the question of prices cannot be more satisfactorily dealt with. At the formation of the Association, Mr. R. O. Paterson said with reference to reasons given for the then depression (£10 10s.): "I never heard more contradictory statements; and it is certainly necessary to form an Association in order to sift these mysteries to the bottom." In the main, this is what your Council has endeavoured to do. These particulars have been given to the members weekly and at intervals in the form of a summary; and on many occasions the members have been exhorted to disbelieve the cries of "No Demand."

After some difficulties, your Council has succeeded in obtaining the shipments of sulphate during 1890 from Gloucester, Bristol, Lynn, Boston, Newcastle, and Middlesbrough. From Plymouth and Southampton it has not been possible; but they may probably be obtained during 1892. It has also been possible to obtain the shipments from the first-mentioned ports for 1891.

Your Council has had under consideration the necessity of the members meeting together at more frequent intervals than heretofore. The necessity for such meetings is now more certainly established; and the experiment will be tried in 1892 not only of quarterly meetings, but of issuing a quarterly report, in the hope that the members generally will use their best endeavours to persuade all sulphate makers outside the Association to join, and also to attend the meetings. The Association is now six years old. It has funds in hand, and carefully organized machinery for collecting and disseminating information of use to the whole trade; and there never was more need for such an organization than at the present moment.

THE POSITION OF MUNICIPALITIES AND GAS AND ELECTRIC LIGHT COMPANIES IN FRANCE.

The French Council of State has lately given a decision of considerable importance to gas undertakings carried on under concessions granted by municipal authorities. The two places specially concerned are not very large; but the question at issue, which has now been settled by the highest authority, was of some magnitude, inasmuch as it turned upon the right of municipalities to authorize electric light companies to enter into competition with gas companies already sanctioned by these bodies. The circumstances that gave rise to the proceedings which culminated in the pronouncement above alluded to may be briefly stated as follows: By virtue of two Treaties, entered into respectively in 1851 and 1857, the Gas Company at St. Etienne had conferred upon them the right to supply public and private lighting in the town for a term of years closing in 1910. The prices and other conditions were duly set out; one being that the public lamps should be supplied gratis during the last 15 years of the concession. There ought not to have been any doubt as to the meaning of the Treaties, seeing that the one of later date contained an article which specially stipulated that to the Company alone would belong the right of furnishing light—whether public or private, whether by gas or any other system—in the town. In the same article there was a clause to the effect that if, owing to the advance of scientific knowledge, any new mode of lighting were discovered, and were generally substituted in Paris and Lyons for the system usually employed, the Company should be compelled to adopt it. In face of all this, the Municipality some time ago gave permission to the Edison Electric Light Company to place in the public thoroughfares cables and wires for the supply of the electric light to private consumers; stipulating for payment of a rent proportionate to the number of lamps fitted up. Thereupon the Gas Company took proceedings against the authorities to obtain damages for breach of contract; and the matter was argued before the Prefecture of the Loire. In the result, the Company failed to substantiate their claim. The reasons for this course appear to to have been these: If, in entering into the contract with the Gas Company, the Municipality conferred on the concessionaire the monopoly of the public lighting, it was not in a position, neither did it intend, to give him a similar monopoly in respect to the private lighting. All it did was simply to grant a certain user of the public highways, which was not to be regarded as prohibitive of the bestowal of like privileges upon others. Failure in the Lower Court did not daunt the Gas Company, who, confident in the justice of their cause, appealed to the Council of State. There the decision was reversed; and the Municipality were condemned in costs. The other case was that of the Montluçon Gas Company against the Municipality of that town. By virtue of a Treaty entered into in 1865, the Company were accorded the exclusive privilege of supplying the public lighting; but, as regards the private lighting, they were only authorized to use the urban roads for the distribution of gas. Subsequently, the Municipality gave permission to the Montluçon Electric Light Company to put up their wires for the supply of electricity to private persons. The Gas Company appealed to the Prefectoral Council of Allier, who decided that they had the exclusive right to place lighting plant in the urban thoroughfares; and assessors were appointed in order to settle the amount of damage sustained by the Company by reason of the authorization granted to their competitors. The Electric Light Company (who undertook to guarantee the Municipality against any expense attending the proceedings taken against them) carried the matter to the Council of State, where, as in the other case, defeat attended them. It was decided most unequivocally that, under the Treaty of 1865, the Gas Company had the exclusive right to use the roads for the supply of light for both public and private purposes, whether by gas or any other system; in return for which privilege, certain advantages were assured to the Municipality. The appeal of the Electric Lighting Company was therefore dismissed, with costs. The effect of these decisions appears to be, in few words, that where a municipal authority have granted a concession to a gas company, they have no power to sanction any undertaking that will be in competition with, and therefore prejudicial to the interests of, their concessionaire, and that if they do so, they will be liable for any damage sustained by their action.

South-East Essex Gas and Water Company, Limited.—This Company has been recently formed, with a capital of £50,000, in £10 shares to supply gas and water to towns and villages in South-East Essex, in accordance with the provisions of the Rochford, Rayleigh, and Leigh Order of last session. A commencement is about to be made with the water portion of the undertaking; and for this purpose £18,000 of the capital is being called up.

PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the London Offices, 16, St. Helen's Place, E.C.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. T. S. Borradaile) read the notice convening the meeting; and it was agreed to take as read the report and accounts, a summary of which appeared in the JOURNAL last week.

The CHAIRMAN, in moving the adoption of the report, said it was, of course, a matter of great regret to the Board that they should have to issue a report which was not quite so rosy even as usual; but he thought, as was suggested in the report, that the shareholders would have somewhat anticipated this, being familiar, as they were, with the position of affairs in Brazil. Owing to the serious drop in exchange, the private consumers had fallen off. The reason the exchange affected private consumers was that they paid the Company at a fixed rate of 27d.; and now that exchange was so very low, it was a losing game for them to pay at this rate. The revenue from illuminations had suffered from the same cause, as well as from the uncertainty of the political future. It would be interesting to the shareholders, perhaps, if he gave a few figures, showing what the consumption had been during the half year ended September last and the corresponding months of the previous year. During the latter period the make of gas amounted to 26 million cubic feet; while in the former period it was 28 million feet. In 1890, they sold 23 million cubic feet; and in 1891, 24 million feet. The unaccounted-for gas was slightly higher. The quantity of coal carbonized was more; while the percentage of cannel used was rather less. The production of gas per ton was a trifle lower. The cost of common coal and cannel was much about the same. The number of public lamps was a little higher, as was also the number of private consumers. The shareholders would naturally say, How is it that, although so much more gas has been sold, the revenue has fallen off? If the accounts for the half years to March and September, 1891, were taken together, it would be seen that the leading items which had changed were: Repairs, gas-fitting revenue and expenditure, public lights and illuminations, and private lights. As to repairs, the item was about £675 higher than before. This, of course, was due to the state of the works, and also to the expectation of the Board that, in view of negotiations with the Government, it would put them in a better position with regard to a new concession, and that therefore it would be worth while to undertake the repairs. The increase in the item of "Gas-fitting revenue and expenditure" was due to a great extension they had made in the public lights, and which should have produced a larger revenue. The income from public lights was greatly reduced, because the Company were subjected to a number of fines, which, as he had before complained, were unjustly levied. In the past half year the fines amounted to £1900; so that the shareholders would see that they took away a considerable part of the Company's profits. When it came to this in a State like Pará (which they had every reason to suppose had a great future before it), it really made one rather uncomfortable, because they found that the more gas they sold, the more the fines were arbitrarily imposed. One of the members of the Board (Mr. Rumball) had been out to Pará on a mission, which he undertook partly at the invitation of the shareholders; and the Directors were full of hopes that his mission would be of the greatest possible benefit to the Company, and so they continued to hope. But just as things appeared to be going on well, there were, as the shareholders were aware, renewed disturbances in Brazil, which upset all their negotiations; and they were now waiting to see what course events would take. Reverting to the subject of the fines, he remarked that the Company had no check upon them; and they were made upon the *ipse dixit* of the rondas who went round to inspect the lights. In order to check the fines, Mr. Rumball, when at Pará, endeavoured to introduce a system whereby returns were made of the lights out by the Company's collectors, and these were countersigned by the inspector. In one instance, the returns showed four lights out, and no small lights; while the Government returned 34 lights extinguished, and 234 small lights. Of course, it was impossible for them to fight against this kind of thing; and, in spite of the fact that they had raised the illuminating power of the gas from 10 to 15 candles, the fines continued to be imposed. The existing contract, the Chairman continued, had been prolonged for twelve months; and to meet this, and also any further extension of the concession, it would be imperatively necessary for them to undertake certain alterations and repairs to the plant. But their treatment in the past did not give them much confidence in incurring fresh expenditure in this direction. Among other things, they would have to lay new mains; the plant also badly needed extension, and the gasholders required renewing. If they were assured of their position, and had confidence that they would be fairly treated by the Government and get their payments regularly, the Company would be perfectly willing to fulfil their obligations. There was one other matter he wished to touch upon. In the Company's contract, there was a clause which entitled them to introduce machinery for gas-making purposes free of duty. This was a most important clause; but the Company did not get the benefit of it. It had become a still more important matter to the Company now that the duty had been increased 25 per cent.; and the Board were doing all they could to obtain the advantage of the clause.

Mr. T. RUMBALL, having been asked by the Chairman to give some particulars as to his visit to Pará, said that his mission had for its principal object negotiations with the Government for renewing the Company's contract. He found there were other competitors; and he had a great many protracted negotiations on the subject. The result was that a proposal had been almost accepted—only subject to a decree of the Central Government at Rio respecting the import duties, because, although the Government at Pará could dispose of local affairs, when it was a question affecting in any way the fiscal rights of the Treasury they had to go to the Central Government. The matter had been before the Government; and the Directors had hoped that it would have been passed in the Company's favour. One of their most influential friends had done his utmost in pushing the thing forward; but owing to recent events, it had been somewhat retarded. He should prefer not to dwell minutely upon the negotiations at present; but he might say that he believed they would lead to important results. As to the question of fines, the Board were extremely anxious when he went out that he should do everything possible to remove any complaint that the Government might have. They increased the illuminating power of the gas, and overhauled the services and public lamps, so as to move forward the good feeling with the Government. Then he inaugurated a system by which the Company's lamplighters could report each night as to the real state of the public lighting; and he (Mr. Rumball) checked their reports by a personal inspection, as day by day there appeared in the *Diario Officiel* very long accounts of imperfect lights. One instance had been referred to, in which he found four lights extinguished, and no defective ones. Judge of his astonishment when, the day after, he found that it had been officially reported that 34 lights had been extinguished, and 234 had been imperfect. He addressed a very strong letter to the President and the Camera on the subject. He also saw the President, who acknowledged that the Company had been harshly treated, and promised to make a very large reduction in the fines. (The August fines were reduced.) He pointed out to His Excellency that this was a matter of the future, and did not affect the past; and he mentioned that they had been very unjustly fined, and nearly £2000 had been deducted from the payments due to them. Further, he assured him that the city was then as well lighted as any city he knew of; and, he might say, brilliantly lighted in places. As the Chairman had observed, the state of the exchange influenced their returns very largely; and if it had not been for this dim shadow, with the improvements they had made, they would have had much better prospects for the future. He had prepared a plan showing how the private lights were distributed in the city, and with the object of counteracting and contending with kerosene, the sale of which was being pushed by the importers. This was one reason why he suggested that gas of higher illuminating power should be given; and that they should have a better selection of gas-fittings. The plan showed that the Company had before them a field in private lighting three times larger than they were now dealing with. The Board, he went on to remark, were very desirous of being on friendly terms with the Government; and his efforts were directed to this to a very large extent, with the result that he believed they were on the most friendly footing at the present time. He took the occasion when he was at Pará to invite the Government, the President of the Municipality, the Engineer-in-Chief, and the Chief of the Police, to visit and examine the works. They did so; and the Governor expressed himself as being exceedingly pleased with their condition, and with all the Company had done to improve them. Referring to the repairs to the works which they had made, he said that these would form part of what they would have to do as soon as the contract was granted to them, when they would have to renew a great portion of the plant, in order to properly carry on the business. He then proceeded to allude to two very important properties which the Company possessed—known as the St. Antonio property and the Cacaolinho property. The former was situated in the city; it was in excellent condition, and ought not, in his opinion, to be sold for less than £4500. The other was purchased in 1874, but it had been quite unproductive. The larger portion of it was valuable for building purposes, but the remainder was swampy ground. A scheme had been drawn up for letting this land out in plots; and one plot had already been let for the erection of a sugar-mill. Before concluding his remarks, he said that unfortunately their Manager (Mr. J. G. Newbigging) was unable to return to Pará with him when he went out; and they were obliged to provisionally appoint the Sub-Manager in his place. He believed no Company were at present, nor had been for some time past, better served by their officers than their own Company.

Mr. CUFF seconded the motion for the adoption of the report.

Several questions relating to the accounts and other matters were asked by Mr. BLUNDELL, Mr. CUFF, General TUPPER, and Mr. NUGENT, the nature of the principal of which will be gathered from the reply of the Chairman. In the course of their remarks, two or three shareholders expressed their appreciation of the services Mr. Rumball had rendered to the Company during his visit to Pará.

The CHAIRMAN, in the course of his reply, said that the present contract was signed in 1862; and it expired during this year. He could not at present say how long a future concession would run; but the Directors had asked for 40 years. As to the raising of money for the payment of the contemplated extensions and repairs, that was a matter the Board would have to take into consideration. To make a call on the preference shares, on which they had to pay 7 per cent., would be a very expensive way of raising capital. Regarding the private lighting, he made a slight mistake when he said that it was paid for at the rate of 27d. He should have stated that it was paid half in currency, and half in sterling; but this was quite sufficient to affect the amount of gas the consumers took. In the case of the public lighting, they suffered in this way: They were paid at an agreed rate; and when payment was subsequently made, down went the exchange. Some time ago, he suggested, to overcome the difficulty with the public lighting, that they should adopt the average meter system; but this was met with the answer that they could not give a sufficient pressure, owing to the smallness of the mains. Respecting the extension of the contract for twelve months, the Camera had engaged that they would pay for any new mains and other like expenditure to which the Company would be put through the lengthening of the contract; and if they were good to their word, the Company would not lose by it. The Chairman also gave satisfactory explanations regarding various items in the accounts to which reference had been made by the above-named shareholders.

The motion was then adopted.

On the motion of the CHAIRMAN, seconded by General TUPPER, the payment of a dividend of 7 per cent. per annum, less income-tax, on the preference shares was agreed to.

The Directors retiring by rotation (Captain J. Walrond Clarke and Mr. A. H. Henry) were next re-elected.

The Auditor (Mr. P. Crellin) having been re-appointed,

Mr. CUFF moved a vote of thanks to the Chairman and Directors for their services. This was seconded by Mr. NUGENT, and carried.

A similar compliment was paid to the officers and the staff; the proceedings then terminated.

EDINBURGH AND LEITH GAS SUPPLY.

The Consumption of Gas.

At the Meeting of the Edinburgh and Leith Gas Commissioners on Monday last week, the minutes presented by the Finance and Law Committee contained the following: "The Collector submitted statement of the gas-rental from the 16th of May to the 15th of December last. The revenue amounted to £85,387 13s. 7d.; being £11,140 10s. 8d. in excess of the corresponding period of the year 1890. At the latter date there was outstanding the sum of £12,986 6s. 9d.; being £4582 18s. 5d. more than at the same period of the previous year. The Collector, however, reported that the collections were now up to the usual."

Mr. J. JAMIESON, directing attention to the above, remarked that it had been the former experience of the Commissioners, in the midst of all their difficulties, to find themselves with an expansive revenue. This had developed at a rate commensurate at least with the growth of the community and with the rise of rental. It was not possible to make an entirely accurate comparison with the earlier periods of the Commissioners' existence, because the first financial period was only 9½ months; but they could see, from the figures available, that there had been in the next year—from Whit Sunday, 1889, to Whit Sunday, 1890—a very large increase of revenue consequent on the greater consumption of gas. Comparing the completed years—the last two—there was clearly shown a considerable rise in revenue, about, he believed, equally divided between the natural growth of consumption and the advance of 3d. per 1000 cubic feet in the price of gas. The actual increase of gas made in the year 1890-91 was about 100 million cubic feet. Now, however, there was a turn in the tide; and it was not a turn that "leads on to fortune"—it was an ebbing tide. The £11,000 of increase was not a relative one, because if they considered the advance in price, they should, instead of having £11,000, show about £17,000. The collector, he remembered, reported that the sum outstanding was about £4000 in excess of that at the corresponding period of the preceding year; but even if they made this allowance, they were still something like £2000 behind the revenue of 1890-91. This was borne out by the fact that, as they were told, the consumption up to this time was 10 million cubic feet less than before. If this went on progressively, it would possibly be nearly 20 millions by the end of the year. How would this affect the revenue? Well, 100 million cubic feet of gas, at 4s. per 1000 feet, would come to £20,000; and at 4s. 6d. (the present price), £22,500. If the cost of manufacture—which might be fairly put at 2s. 10d. per 1000 cubic feet—were taken into account, about £14,000 would be absorbed; leaving a loss of profit to the Commissioners of some £6000 on the year, owing to the decrease in consumption. He took it that this was to be attributed to what he might call the excessive price of gas in Edinburgh and Leith; showing that some consumers were at least forced to exercise economy, or to look to other illuminants instead of gas. Of course, he did not expect the Commission could give any deliverance on the matter just now. He only stated the facts as an enlightenment, perhaps, to a good many members for the present; and probably it might lead to some guidance for the future, when they had to determine more exactly the price at which they were able to sell gas.

Bailie ARCHIBALD said he did not know what was the object of all these figures and calculations. He did not quite know whether or not Mr. Jamieson bewailed the enormous extent of their business.

Mr. JAMIESON: Decrease.

Bailie ARCHIBALD dissented. He saw the gas business did not always remain the same. It increased sometimes at a much more rapid rate than at others; and last year, as Mr. Jamieson had told them, they had an enormous increase—100 million cubic feet. This, he believed, was unprecedented in the concern, or in any business of the kind near Edinburgh. Though they should find at the end of this year a consumption of 10 million cubic feet less than that of the previous year, this would leave 90 million cubic feet increase in two years; and he considered this was something to be proud of. The preceding year they had an increase of, he thought, 44 to 45 millions; and he did not know that the gas companies had ever experienced anything like that. He should expect that the Commissioners would have a very handsome profit at the end of the current year. Comparing December, 1891, with the corresponding month in 1890, it would be found that there had been an excess of, in round numbers, a million cubic feet of gas consumed in the former as compared with the latter period. This surely did not look like a decaying business. On the contrary, it was in a very healthy and satisfactory state; and if they were enabled, at the close of the year, by means of a good profit, to reduce the price of gas, he was sure all would be delighted to make the reduction. But, so far as they knew just now, the price of first-class coal was as high as ever; and whether they could buy second-class coal, and still keep up to 26-candle power gas, was quite another question. He had made these observations in case the public might be led to think that the Commission was in a bad state, while the fact was that they were in a very satisfactory position.

Mr. POLLARD said Mr. Jamieson had given them no further information than they had actually had before them. He had argued that the diminution in the consumption of gas in the current year, as compared with last year, was attributable to the excessive price charged. Very likely it was; for if they raised the price of anything, they must certainly diminish its use. It was inevitable that the consumption should be affected by the price of gas going up. But there Mr. Jamieson had stopped; and having stopped there, he (Mr. Pollard) did not think he had aided them much in all he had said. Had he shown how they might lower the charge for gas, he would have made a real contribution to the business of the Commission. So long as the price of gas was maintained as at present, and they were unable to reduce it this year, they would have to lament that the consumption did not go up with such leaps and bounds as it did at a time when the figure was not so high. For his own part, he was quite certain that when the price was reduced, the consumption of gas would go up.

Mr. KINLOCH ANDERSON said, while it was a fact that the consumption at the last balancing period was smaller than at the preceding one, during the month of December, 1891, it had practically been a million feet higher than the corresponding month of the previous year; and if there was one month out of the twelve which might be taken as a good criterion of the consumption of gas, it was December. He thought their position was quite satisfactory.

Mr. JAMIESON said it was exactly his contention that the tendency of a rise in the price of gas was to decrease the consumption; and in future they might obtain some guidance from this fact when fixing the charge. The decrease in the consumption ought to make them push forward with the remit under which they would ascertain the price of coals in Edinburgh and Leith relatively to other towns, and the discrepancy in the price of gas between Edinburgh and other large cities. It should also make them practise economy in all possible directions.

The minutes were then approved of.

At a subsequent period of the meeting, the report of the Gas Engineers (Messrs. Mitchell and Linton) for the past month was presented. It showed that, at the Edinburgh works, 146,093,000 cubic feet of gas had been made, as compared with 143,027,000 cubic feet during the corresponding month of 1890; and at the Leith works, 61,768,000 cubic feet, against 63,947,000 cubic feet. The average price of coal per ton at the Edinburgh works had been 18s. 0·8d. for the month, against 16s. 4·1d. for the corresponding month of 1890; while at the Leith works it had been 20s. 3d., against 17s. 9·25d. The cost of lime and wages for purification per 1000 cubic feet of gas made had been, at the Edinburgh works, 1·01d. for the month, as compared with 0·97d. for December, 1890; and at the Leith works, 1·04d., against 1·07d. The average number of retorts working had been, at the Edinburgh works, 512 during the month, and 535 during December, 1890; and at the Leith works, 201, as compared with 206 during the corresponding month of 1890. The average illuminating power of the gas made at the Edinburgh works last month was 26·46 candles, against 26·34 candles in December, 1890; and at the Leith works, 26·84 candles, as compared with 26·57 candles.

THE PROPOSED PURCHASE OF THE SUTTON COLDFIELD GAS-WORKS BY THE CORPORATION.

A Meeting of the ratepayers and burgesses of Sutton Coldfield was held last Thursday night, to consider the question of the suggested purchase of the gas-works by the Corporation. The Mayor (Alderman J. T. Glover), who presided, made a few remarks in opening the proceedings, and then several speeches followed, both in favour of, and in opposition to, the proposed transfer. A number of questions were afterwards addressed to the Engineer who is advising the Corporation (Mr. E. H. Stevenson, M. Inst. C. E.). In reply, he said he had made his estimate of the allowance from Birmingham for the reconstruction of works in accordance with the arbitration in 1879, when the undertakings of West Bromwich, Smethwick, Oldbury, and Tipton were purchased from Birmingham. It had been laid down that no works to supply 11,500,000 cubic feet of gas could be built at a less cost than £500 per million cubic feet. He regretted to find that he had been termed a partizan of the scheme by the opponents, inasmuch as it was nothing to him whether or not the works were purchased. He should not have recommended the transfer if the Company had been well managed in competition with Birmingham; but seeing that it had been badly managed, it could be bought for "a mere song," and would be valuable to the Corporation. Birmingham was fortunate in having only 6 per cent. of leakage, seeing that it was largely undermined; and the same applied to West Bromwich, where it did not reach 9 per cent. No place not undermined, and having a subsoil like Sutton Coldfield, ought to have more than 5 per cent. of leakage. Great towns like London were too big, and became unwieldy. Gas undertakings were profitable up to a certain point, beyond which they lost money. If it went on as it had done, Birmingham would be the same; and then places like Sutton Coldfield would have to pay for it. He should be ashamed of any gas manager, himself included, who could not make, with practically new works, 10,500 cubic feet of gas per ton of coal, with 15 per cent. of coke for carbonizing, and with 5 per cent. of leakage. The Mayor then put the resolution approving of the application to Parliament for the necessary powers to purchase the gas undertaking, and he declared it carried by four votes to one. The opposition demanded a poll; and the proceedings concluded with a vote of thanks to the Mayor for presiding. The papers for the poll will be delivered on the 22nd inst., collected on the 26th, and the result declared at a public meeting on the following day.

Sunderland and the Electric Light.—A special meeting of the Highways Committee of the Sunderland Corporation has been held, to consider offers for lighting with electricity that part of the town comprised in the Provisional Order which was obtained by the Corporation in 1891. Applications had been invited by the Corporation from companies prepared to take over the powers which the Provisional Order vested in them, and two were received—viz., from the Brush Electric Supply Company and Messrs. Andrews and Co., of London. The former proposed to take over the Order with all its obligations, on condition that the Corporation assisted them to form a local Company, that at the end of 21 years the Corporation should have power to acquire the works as a going concern at a valuation and payment to be agreed upon for the goodwill, that they would pay a royalty of 10 per cent. on the balance of receipts over expenditure, that the Corporation should cause the main thoroughfares to be lighted at such a price as should be arranged hereafter, and that no concession of any kind be granted to any other company. Messrs. Andrews proposed to take over the area mentioned in the Order, to supply it with electricity for lighting purposes on the alternating current high-pressure system at a uniform charge of 3¾d. per Board of Trade unit, and to pay the Corporation a rental of £100, together with a royalty according to the consumption. They required payment for the goodwill if, at the end of 21 years, the Corporation wished to acquire the concern. The terms of both offers were discussed; and it was ultimately agreed to submit them to Mr. J. N. Shoolbred, who had previously been consulted by the Committee with regard to the Order, and to await his report.

LONDON WATER SUPPLY FROM THE THAMES AND LEA.

Our readers may remember that, in July last, the Engineer of the London County Council (Mr. A. R. Binnie, M. Inst. C. E.) was instructed to prepare a report embodying the information contained in the various reports ordered by the Special Committee on Water Supply and Markets, and other recent information bearing on the question of obtaining a further supply of water from the Rivers Thames and Lea. The report was presented in due course, and was noticed at the time in our article on "Water and Sanitary Affairs." In view, however, of the approaching investigation of the Metropolitan Water Question by a Royal Commission, it may be useful to deal with it at greater length.

Mr. Binnie begins by stating that, in attempting to throw into a connected form the results of recent inquiries, he did not rely exclusively on the various reports he received, or upon information collected in the office of the Council, but sought to make his report a concise statement of all the data which had come to his knowledge. He likewise endeavoured to embody therein the opinions of the highest authorities who have expressed themselves on this matter. He then goes on to say that the subject is of the first importance in considering the question of the future water supply of London; because if the Thames and Lea can afford all the water likely to be required, it would be useless to look to more distant sources. On the other hand, should it be found that these rivers can yield, even after the construction of costly works, a quantity sufficient only for a comparatively short period, it may be deemed prudent to concentrate further expenditure on some new source, rather than on an attempt to increase the supply from the valleys of the Thames and Lea. Further, it may be found inadvisable to depend entirely on a supply derived from a thickly-populated area, which, under certain conditions, may possibly become a danger to the health of the community. The London Water Companies claim that the present state of their works is good, and will continue good for many years; and also that, in valuing the undertakings for purposes of purchase, future, but as yet unearned, profits ought to be included. But should investigation show that no further quantity of water can with safety be abstracted from the Thames and Lea areas, or that a large capital expenditure, either to increase the present or to bring in a new supply, is to be anticipated at an early date, then it is clear that the value of the undertakings of the Companies will be materially affected. Viewing the question broadly, it will be seen that it resolves itself into an inquiry into the quantity and quality of the water that can be derived from the Thames and Lea, including water from the springs, both surface and deep seated, which flow into those rivers; for, as pointed out by the Royal Commissioners of 1869, "it follows that any water obtained by tapping the chalk reservoirs that feed either the River Lea or the Thames above Hampton would only *pro tanto* diminish those streams, and would therefore be little or nothing gained to the general supply."

Proceeding to deal with the Thames Valley, Mr. Binnie states that above the intakes of the London Water Companies at Hampton, Molesey, and Sunbury, the area draining into the Thames comprises upwards of 3542 square miles, or 2,267,233 acres, embracing parts of the counties of Berkshire, Buckinghamshire, Hertfordshire, Hampshire, Wiltshire, Surrey, Oxfordshire, Middlesex, and Gloucestershire, with small portions of Sussex, Warwickshire, Bedfordshire, Worcestershire, and Northamptonshire. This area may, geologically speaking, be said to consist, first, of the London clay and other tertiary beds, which lie between London and a line passing through Newbury on the west, by way of Reading, Maidenhead, and Uxbridge, to near Watford on the east. The river then drains a district composed of the cretaceous formation of chalk, greensand, &c., the boundary of which is a line extending from Swindon on the west, by way of Wantage, Oxford, and Aylesbury on the east. Finally, above Oxford, in the upper part of the valley, it drains a district composed of the Oxford clay, great and inferior oolite, &c., which extends from near the Cotswold Hills on the west, to Priors Marston on the north-east.

The annual rainfall of the valley, as shown by the report of Mr. G. J. Symons, F.R.S., as far as Reading, Maidenhead, and Uxbridge, averages about 24 inches; between these places and Tring on the north, and Moreton, Witney, Fairford, Cricklade, Swindon, East Ilsley, Newbury, and Basingstoke on the west and south, it runs up to 27½ inches. Above these points, at the head of the valley, it probably averages as much as 32 inches. The average flow of the river at Teddington Weir, a few miles below the intakes of the Water Companies, would be about 79,000 million cubic feet per annum if it included the quantity abstracted for water supply. This flow would represent nearly 9⅝ inches of rainfall actually flowing from the whole of the catchment basin above the intakes. But it need hardly be pointed out that the flow varies very considerably in different years and during different months in the same year. For instance, the corrected discharge at Teddington sometimes rises as high as 3000 to 4000 million gallons a day during periods of autumn flood, and falls as low as 255 to 308 million gallons daily during the drier months of the year.

The valley of the Thames above the intakes of the Companies contained a population of some 762,000 persons in 1851, of 810,000 in 1861, of 887,000 in 1871, of 947,000 in 1881; and it is estimated that at present it considerably exceeds 1,000,000. Besides this human population, it is found, from the returns to the Board of Agriculture of 1890, that there are in the Thames Valley, above the Companies' intakes, 75,256 horses, 265,673 cattle, 1,101,095 sheep, and 187,534 pigs.

The average quantity of water abstracted from the Thames for the supply of London in 1858 amounted to 35,387,000 gallons per day, and was increased in 1890 to 90,400,000 gallons; showing a rise of more than 154 per cent. during that period. It should be noted that the whole question of the supply of water from the River Thames was fully investigated by the Royal Commission of 1869, who say, in the 141st paragraph of their report: "Considering the whole of the evidence above referred to, we believe we are justified in inferring, in the first place, that the quantity at present authorized—namely, 110 million gallons per day—might safely be drawn from the main stream of the Thames in its present state; and, secondly, that, by means of proper works for storeage, this quantity might be doubled if required." The Royal Commissioners based this opinion on the assumption that the flow of the river never fell below 350 million gallons per day; but as, from actual observation, it is found that the flow falls as low as from 255 million to 308 million gallons daily, and this not on exceptional days, but for periods of a month at a time during some of the drier months, the inferences of the Commissioners have not been justified by experience.

Having given the foregoing brief summary of the salient features of the Thames basin, Mr. Binnie goes on to deal with them in more detail; taking up first the quantity of water abstracted from the Thames by the various Water Companies. On this he says: Looking back to the report of the Royal Commission of 1869, I observe that the quantity of water authorized to be abstracted at that period amounted to 110 million gallons per diem. Very considerable obscurity exists as to how this quantity was authorized, and as to how it has since been increased; and although, at the recent inquiry before Sir Matthew White Ridley's Committee, the Companies and the Conservators of the Thames were invited very particularly to elucidate their legal powers, they carefully abstained from throwing any light upon the subject.

In a reply given to the Royal Commission of 1869, Captain Burstall, then the Secretary to the Thames Conservancy Board, stated that each of the five Companies were limited to a draught of 20 million gallons a day under arrangements made with the Corporation of London in 1852. By the "five Companies," he clearly meant the Chelsea, the Grand Junction, the Lambeth, the Southwark and Vauxhall, and the West Middlesex; but to these I must add the East London Company, who, under their Act of 1867, were authorized to draw 10 million gallons a day. This is confirmed by the remarks of the Official Auditor, Mr. Stoneham, in the 18th annual report of the Local Government Board (for 1888-9), from which I gather that, in consequence of an agreement made in 1886 between the Thames Conservancy and the five Companies above noted, they were permitted, in consideration of contributing certain sums of money to the funds of the Conservators, to increase their draught in the following proportions: The Chelsea Company, by 2 million gallons a day; and the Grand Junction, Lambeth, Southwark and Vauxhall, and West Middlesex Companies, by 4½ million gallons a day each—the 10 million gallons authorized by the East London Company's Act remaining as before. This brings the total authorized quantity up to 130 million gallons a day. Considerable doubt exists in my mind as to the legality of this agreement between the Conservators of the Thames and certain of the Water Companies, particularly the West Middlesex and the Chelsea Companies, as I perceive from the West Middlesex Company's Act of 1866, section 8, and the Chelsea Water-Works Act of 1875, section 25, that these Companies are restricted to drawing a quantity not greater than 20 million gallons a day. It is difficult to understand how a mere agreement can set aside a statutory provision in an Act of Parliament; and it is certainly most inexpedient that the Thames Conservancy—a body charged with the custody of the purity and flow of that river—should have a direct money interest in the quantity of water abstracted from it by the Companies. In fact, the whole question of the authorization to draw water from the Thames by the Companies must be fully and carefully investigated before any attempt is made to purchase their undertakings, particularly as there are strong reasons for believing that it would be most dangerous to abstract a much larger quantity than they at present draw, when we have regard to the sanitary state of the river below the intakes. That the maximum quantity which may safely be taken from the river has been reached, is shown by the fact that the quantities abstracted in August, 1885, amounted, on an average, to 31⅜ per cent. of the total flow, and on the 3rd of August of that year to 37 per cent. of the total volume; and the average quantity abstracted in August, 1887, amounted to 29·65 per cent., and on the 14th of that month to 39·6 per cent. The figures from which these percentages were derived are all of an official character; and although they were at one time impeached during the course of the inquiry, they were afterwards fully acknowledged by the Counsel for the Thames Conservators. The subject of the large quantity of water abstracted in dry weather from the diminished stream of the Thames is of the utmost importance to the health and well-being of the Metropolis as a whole; for as pointed out in my report on the London Water Supply of October, 1890, and in the joint report by Sir Benjamin Baker and myself on the subject of the Main Drainage of London, dated Feb. 19, 1891, the abstraction of so large a quantity at so critical a period in the height of summer decreases the power of the river to discharge downwards into the sea any polluting matter which may enter it in its passage through London. The tidal action does not at every tide discharge the whole quantity of polluting matter contained in the river into the estuary at the Nore, but causes it rather to oscillate backwards and forwards through the Metropolis; its downward course to the sea being determined by the volume of the upland waters which pass over Teddington Weir. If further abstraction of water is not carefully guarded against, I fear that a state of affairs may arise to the river which will be most unpleasant and disastrous to the inhabitants of London.

After a few remarks on the subject of the control exercised over the Water Companies by the Local Government Board, Mr. Binnie gives some statistics as to the population of the Thames Valley. He says the total population of the valley of the Thames above the intakes of the Water Companies has increased since 1851 from 762,000 to upwards of 1,000,000 persons, or at the rate of 32½ per cent. in 40 years. But this mode of stating the case does not clearly represent the actual facts; for the population is not equally distributed per square mile or per acre, but a large proportion reside in some 202 towns and villages, each with a population exceeding 1000 persons, and which amounted in the whole to 480,000 persons in 1851, to 532,000 in 1861, to 610,000 in 1871, to 684,000 in 1881, and is estimated at the present time to be 752,000. From these figures it will be seen that the urban population bore a proportion to the total number of inhabitants of 63 per cent. in 1851, 65 per cent. in 1861, 69 per cent. in 1871, 72 per cent. in 1881, and (say) 75 per cent. in 1891. So that not only has the total population increased since 1851 by 32½ per cent., but there has been a marked increase in the proportion residing in towns and villages. In the total 202 towns and villages of 1000 inhabitants and upwards,

we find that the population has increased from 480,000 to 752,000 persons, or at the rate of 57 per cent., during the past 40 years. If now, however, we turn our attention strictly to the towns and villages situated on the banks of the Thames, and which are 29 in number, we perceive that their population has increased from 122,247 in 1851 to 202,083 in 1891, or at the rate of 65⅛ per cent. Again, if we turn to the principal towns and villages situated on the tributaries of the Thames, and which amount to 83 in number, we observe that the population in 1851 was 189,964, and that in the present year it is estimated at 383,096; showing an increase at the rate of 101⅛ per cent. From these figures we see that, during the past 40 years, the total population of the Thames Valley has increased 32⅛ per cent.; the inhabitants of the 29 towns and villages situated on its banks have increased 65⅛ per cent. of the population; and those of the 83 towns and villages situated on the tributaries have increased at the rate of 101⅛ per cent. But if we look at some of the individual towns on the Thames, we find that Staines has increased during the past 40 years 106 per cent.; Egham, 125 per cent.; Reading, 128 per cent., Caversham, 139 per cent.; Clewer, 152 per cent.; and Weybridge, 196 per cent. The bearing of these facts on the question of the London Water Supply is of paramount importance, as it will be observed that the population is concentrating itself into towns and villages, which are increasing with great rapidity; and that these towns and villages are principally situated either on the Thames itself or upon its tributaries. Consequently, they must all inevitably drain directly into the streams and river from which the inhabitants of the Metropolis receive their drinking water. As before noted, besides this human population, there is a total animal population in the district referred to exceeding 1,600,000.

The flow of the River Thames and possible future increase of the supply by means of storeage reservoirs is the next subject to engage Mr. Binnie's attention. On this he says: It will have been noted that the Royal Commissioners of 1869, in the paragraph above quoted, conclude with the words, "and that, by means of proper works for storeage, this quantity might be doubled if required." I have already mentioned that in dry weather, for days at a time, the Companies draw upwards of 100 million gallons of water daily, representing some 30 to 40 per cent. of the total flow of the river at Teddington Weir. It is hardly likely that Parliament will long permit this state of affairs to continue; and if the suggestion of the Royal Commissioners of 1869 is to be carried out, the construction at some point in the valley of the Thames, above the present intakes, of reservoirs for the storeage of flood water must be undertaken. In other words, some attempt will have to be made to store up flood water against periods of extreme drought, either to afford an increased supply, or to provide proper compensation for the quantity abstracted from the river. I must here draw attention to the nature of this flood water. It is always highly polluted, discoloured, and often obnoxious to sight, to taste, and to smell. The question arises how far it would be safe to store for future use this highly-polluted water; for, whatever may be said with regard to the purifying action of the flowing river on organic impurity that may be passed into it, the question is quite different when it is proposed to store up for many months, in large reservoirs, the most polluted water which comes down the stream. Considering how thickly inhabited the Thames Valley is, and how the present Water Companies have found it impossible to use flood water for domestic purposes, this proposal to store it up in large reservoirs hardly commends itself to my judgment as a wise or prudent step. I have known the Thames Valley for the greater part of my life. I have also for many years been engaged in the construction of large storeage reservoirs; and I can safely say that I know of no sites in the valley suitable for storing water for the domestic supply of the Metropolis, and up to the present time no engineer who has had any considerable practice in the construction of large impounding reservoirs, such as those now under consideration would have to be, has ever given his opinion in favour of such a scheme. I therefore fear that the Council must not hope to find in the construction of storeage reservoirs a solution of this most difficult question. Although the Water Companies who now supply London have often been in great straits to increase their supplies, and have had the advantage of the advice of competent and talented engineers, I am unaware that any of them have at any time suggested definite storeage works in the Thames Valley. One fact, however, should be kept in mind—that, were such storeage works possible or expedient, they could not be constructed at such an altitude as to deliver a supply of water by gravitation in the Metropolis; so that, in the future as in the past, pumping would have to be resorted to, with its continued annual cost of more than £127,000, in addition to the enormous initial expenditure which storeage works would inevitably render necessary.

Mr. Binnie next deals with the chalk and other spring water in the Thames Valley. He says: We have seen that at present, in dry weather, the Water Companies draw upwards of 100 million gallons a day, or (say) 40 per cent. of the total volume of the Thames, at Teddington. Were this or any similar quantity drawn from wells in the upper valley of the Thames above Reading or Oxford (and in the future we certainly shall require a larger amount if the consumption is to increase at the rate of 154 per cent. in the next 40 years, as in the past), it would not mean that 40 per cent. only was taken out of the stream. On the contrary, the volume of water in the river would be enormously decreased; and as its flow above those points is, owing to its more limited drainage area, comparatively small, there would probably be taken from the upper valley a supply more than equal to the total average summer flow of the river. Were this done, two things would have to be provided for—one, the construction of suitable storeage reservoirs to compensate the river below the point at which the water was abstracted; and the other, securing that the abstraction of the water from the wells did not injure the general water supply of the district lying at higher levels than the places whence it was drawn. The practicability and the prudence of constructing storeage reservoirs in the Thames Valley, I have previously dealt with; but I must point out that there are already grave complaints to the effect that the pumping now going on in the valley of the Lea is affecting not only the springs and rivers, but also the general character of the water supply to the county of Hertford. We know also that powerful combinations of millowners and residents on the banks of the Mole, the Wandle, and the Colne, are fully organized to prevent the abstraction of further quantities of water from those rivers; and like combinations would undoubtedly result on any serious attempt to abstract, from the valley of the Upper Thames, the spring and other subterranean waters which now feed the tributaries of that river. One of the difficulties sure to arise would be that claims for compensation in kind would be made which it would be impossible to meet. On the chalk and oolite formations, out of which we are supposing the water to be abstracted, it is impossible to construct reservoirs; and as the abstraction of so large a volume of water by means of headings and wells, as suggested by Sir R. Rawlinson, would have the effect of lowering the line of saturation in the district generally, it would be necessary to provide for the cases arising from the drying up of the springs, wells, and streams which at present flow down to the river, but which would be intercepted by this mode of abstracting the water. Looking nearer to London than the upper valley, I find that the intra and extra Metropolitan areas are, according to the report of the Water Examiner for May, 1891, supplied with water to the extent of 179,908,849 gallons a day, of which only 25,383,525 gallons, or 14·11 per cent., are drawn from springs and wells, which is but a small proportion of the total quantity supplied. London is also surrounded by small Companies or corporate bodies, who at present derive their water supplies from the chalk, greensand, &c.; and we can hardly expect that they would stand passively on one side were it proposed to take from their several districts the large volume of water which would be required in the future for the supply of London. The Kent Company, which at present supplies a portion of the county of London and a considerable area outside, draws its water entirely from chalk wells; and it has increased its supply from this source from about 3½ million gallons daily in 1858, to nearly 12½ million gallons daily in 1890, or by more than 260 per cent. Such an extensive draught on this district cannot long be continued; and complaints are made that certain of the streams in the area of the Kent Company, which formerly broke out at higher levels, now flow at a considerably less altitude. From the Upper Lea Valleys similar complaints are heard, owing to the excessive pumping from the wells of the New River and East London Companies. This is an indication that the general line of saturation in the chalk is being lowered; and it would therefore hardly be prudent to calculate upon obtaining any very large increase from this source, such as would be contemplated were it proposed to abandon the open rivers—Thames and Lea—as a means of supply.

With regard to supplies to be obtained from the gravel-beds of the Thames Valley, Mr. Binnie says: It has been suggested that a large amount of water could be obtained by pumping from the gravel-beds which extend over the Thames Valley at points between Slough and Windsor and the present intakes of the Water Companies. It is alleged that these gravel-beds are supplied from the chalk formation, which is said to outcrop beneath them; that the water so derived does not join the Thames until it reaches some point below Teddington Weir; and that, consequently, a large volume could be abstracted for the supply of London without in any way interfering with the natural flow of the river. The whole subject of this proposed supply was discussed during March, 1891, before the Institution of Civil Engineers, on a paper read by Mr. J. Thornhill Harrison, M. Inst. C.E.* The result of that discussion was not very favourable to this mode of obtaining a supply of water. As I before noted, and as pointed out by the Royal Commissioners of 1869, any water abstracted from the springs which feed the Thames is *pro tanto* abstracted from the river itself; and it is clear that, should the water in the gravel-beds be pumped to a lower level than that in the adjacent river, it would not only be intercepting water which would otherwise flow into the stream, but be actually abstracting direct from the river a considerable quantity of the water flowing in it. To my mind, however, it is not clearly proved that the water exists in the quantities estimated by Mr. Harrison; and I also fear that it has not been proved on a sufficiently solid basis that the water breaks out in the bed of the Thames in volumes large enough to warrant us in expecting to obtain a supply adequate for our wants from this source. When I come to speak of the pollution of the subsoil of the Thames Valley at present existing, and which may be expected generally to increase, it will be seen that, under any circumstances, even supposing the water to be available, it only could be obtained at a certain amount of risk. This would be especially the case in dry weather, as then doubtless a large amount of drainage and cesspool water flows into these gravel-beds.

(*To be continued.*)

THE ARTESIAN WELL IN THE CITY OF LONDON.

At the Meeting of the Commissioners of Sewers of the City of London last Tuesday, Mr. Malthouse brought forward one of two motions, adjourned from Nov. 3 last, as follows: "That if the water from the artesian well be found, by analysis, to be pure and fit for domestic purposes, it be referred to the Engineer to take the necessary steps to supply the same to the artizans' dwellings." Mr. Sayer suggested that the portion of the Medical Officer's report relating to the analysis of the water should be read at this juncture. This having been agreed to, the Medical Officer (Dr. Sedgwick Saunders) read his report, to the effect that the chemical constituents of the water were characteristic of the analysis he submitted to the Court on Nov. 17 last; and he congratulated the Commissioners upon the success which had attended the completion of the well. The supply of water was abundant, and exceedingly wholesome for every purpose of domestic life. Mr. Malthouse, in moving the above resolution, claimed that the existence of this well formed a great factor in the future settlement of the water question, so far as the citizens were concerned. The Medical Officer had proved that the water was far purer than that obtained from other sources near London; and the Engineer had told them that the well was capable of supplying 100,000 gallons of water per day. It was true that the cost of the new supply would be greater

* See JOURNAL, Vol. LVII., p. 512.

than the present; but he set off against this the fact that the citizens would be delivered from the injustice from which they had long suffered through the statutory powers of the Water Companies. Mr. Sayer seconded the motion. Mr. King, in moving an amendment to the effect that the matter should be referred to the Finance and Improvement Committee, as being the custodians of the artizans' dwellings, to consider as to the advisability of obtaining a supply from this well, pointed out that the cost would be very much greater than was ever anticipated. Mr. Woodrow seconded the amendment. Mr. Edmeston said he thought the Engineer should give the Court some information as to the cost of new pipes and fittings in the artizans' dwellings. The Engineer (Mr. W. Haywood), in reply to several questions, said the cost of pipes and fittings would be £1690; but this had nothing to do with the cost of pumping, which would be from £137 to £140 per annum, exclusive of depreciation account or interest on capital. The whole of the water could, he thought, be raised in six hours a day, and would be placed in the cisterns at the tops of the houses from which the supply was now obtained. As to the total cost of the well, the accounts were not yet made up; but up to now it had been about £3500. A large part of this was for a clerk of the works. He had only estimated the cost of serving the artizans' dwellings; but if the supply went beyond this, it would involve serious considerations. The water needed for the dwellings was 20,000 gallons per day; and the quantity available from the well was 70,000 or (probably) 100,000 gallons. Mr. Sly asked whether the alteration in the supply would affect the arrangements in case of fire. The Engineer replied that, in the event of fire, the water from the mains of the New River Company would be used, as the Company were compelled to supply water for extinguishing conflagrations. Mr. Bedford said it seemed to him that, having secured a magnificent supply of water, it would be ridiculous to abandon it. This was not a small question, but the beginning of a very large one; for if they could sink a well in one part of the City, they could do the same in other parts. As to the assertion that the Commissioners could not sell water, he denied it. The Companies had no monopoly of the sale of water. Mr. Sly pointed out that the well had already cost the ratepayers £5190; and Mr. Wallace argued that it would not be prudent to pledge the ratepayers to any other excessive expenditure. After further remarks, the amendment was put, and lost by 22 votes to 30. A second motion standing in the name of Mr. Malthouse, to the effect that the Engineer should report upon the advisability of supplying water from the well to the inhabitants of the Ward of Portsoken for domestic purposes, was held over.

Referring to the above project, a correspondent writes as follows: "The Corporation have sunk their artesian well at a cost of £3500; a further expenditure of £1600 is required for pipes and mains to the artizans' dwellings; and they contemplate an annual outlay of £130 to £140 a year as the cost of pumping. Allowing for the repayment of the capital in 50 years, on the 3½ per cent. table, the annual sinking fund required would be £41 16s. 5d.; the interest upon the capital expended, £178 10s.; and the annual expenditure, £130—making a total of £350 6s. 5d. The present supply is afforded by the Company at about £80 a year; thus leaving a deficit of £270, upon which the Corporation congratulate themselves, as having 'broken down the monopoly of the Water Company.'"

THE NEW FILTRATION WORKS OF THE BELFAST WATER COMMISSIONERS.

An interesting lecture on the above subject was delivered last Wednesday evening, in connection with the Belfast Natural History and Philosophical Society, by Mr. L. L. Macassey, C.E. Having given some statistics as to the growth of the population and the demand for water, he proceeded to describe the new filter-beds which are being constructed by the Water Commissioners. Before they decided upon the class of filters they should adopt, a full examination was made of nearly all the water-works filters in the United Kingdom; and they determined to follow the same lines as London, Dublin, Bradford, Edinburgh, Liverpool, and a number of smaller towns. In these places the water authorities had adopted vertical filtration through a layer of sand, supported on other layers of gravel and broken stones, the total thickness of the filtering materials varying from 4 feet to 8 feet. Throughout England the speed of filtration per 24 hours per square yard of filter surface was from 1000 down to 500 gallons; and in the new works about to be described the speed would be 500 gallons. For dealing with that portion of the Belfast supply which came from the Carrickfergus district, and which amounted to 7½ million gallons per day, five filter basins were being constructed at Oldpark, near the present high-service reservoir. One bed, he said, would be alway out of use for cleansing; so that four would have to do all the work of filtration. The average effective area of each basin would be about 3800, and the total of all the beds something like 19,000 square yards. The quantity of water to be dealt with here would vary from 3 million to 4 million gallons per day. Each bed would have an effective area of about 2700 square yards. Thus at both stations there would be in all some 30,000 square yards of sand area. The mode of construction of all the filters was the same. The basins were formed by cutting or filling, according to the levels of the ground. The bottom and slopes were lined with 9 inches of concrete; and a neat cope was formed above the ground-line. Along the centre of the floor there was a drain or channel for collecting and conveying the filtered water to the outlet. The filtering material began at the bottom with a layer of whinstone larger than road metal, gradually reducing in size to chippings, then to gravel. Afterwards came a 2 ft. 6 in. layer of Dundrum sand, finishing fine on the top. The total thickness was about 5 ft. 6 in.; then there was 1 ft. 6 in. water space, and 2 feet margin. In total depth the filter-basins measured 9 feet. The works would cost in all about £70,000; and they would be capable of filtering some 11,500,000 gallons of water per day. The working expenses and cost of capital would come to about £3650 per annum, or £10 a day. This worked out at 17s. 4d. for filtering each million gallons of water, or one-fifth of a penny per 1000 gallons.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

But for the astonishing speech of Mr. John Jamieson at the meeting of the Edinburgh and Leith Gas Commission on Monday last, there would be little in the proceedings that would be worthy of notice in this column. I feel inclined to say that, if ever there was an instance of a round man being in a square hole—not the other way—that man is Mr. Jamieson. Why he should be a Gas Commissioner, I cannot understand. It was he who, in the beginning of last year, when the Commissioners were in straits for coals owing to the railway strike, sought, for a body of strikers, an interview with Mr. Mitchell, with a view to having a stop put to arrangements which had been made for the supply of coal to the gas-works. He acted then professedly in the interest of the working man. It is Mr. Jamieson who, along with Mr. Manclark, has given notice of a motion which virtually means that when the collectors are laid aside by sickness, their pay shall be stopped. The working classes will not thank him for that motion. Mr. Jamieson's voice was one of the loudest in the complaints that were made a year ago regarding the reduction in the illuminating power of the gas. Now, when he has had his way and gas of higher illuminating power is being manufactured—necessarily at a higher price—he is the only man in the Commission who has expressed dissatisfaction with the results of the policy which the Commissioners adopted to please him. He is a man of such contradictions, that it is altogether impossible to understand him. His speech on Monday was intended for the enlightenment of "a good many members," which was rather a conceited thing for him to say, when his record is taken into account. It is not necessary to follow him into all his rigmarole; his statement that in the decreased consumption of gas "they might get some guidance from that fact when fixing the price," is sufficient to set him aside. The sentiment conveyed in that sentence would seem to be that hitherto the Commissioners have taken no thought of such a matter when arranging the price they should charge for gas. This displays a juvenility of mind which I would not have expected in any Gas Commissioner. Laying aside Mr. Jamieson for the present, it is to be observed that the Commissioners have earned £11,140 more than they had at this time last year, upon a decreased consumption of about 10 million cubic feet of gas. The augmented revenue is, of course, derived from the increase of 9d. per 1000 cubic feet which was imposed last April; and the decreased consumption has partly followed this increase. There are, however, other causes for the falling off, one of which is that in the summer of 1890 there was an exhibition in Edinburgh which required a lot of gas, and another is that the gas being now of higher illuminating power, less of it is consumed. Taking both these circumstances into account, it is satisfactory to find that the consumption in December last showed an increase over the previous December of 887,000 cubic feet. This fact alone speaks volumes for the elasticity of the Commissioners' business; and should be quite sufficient to silence all croakers, whether within or without the Commission.

The least satisfactory part of the business before the Commissioners was that which had reference to the sale of spent lime. Not quite two years ago, if I recollect aright, they acquired a plot of ground at Loanstone, near Pennicuick, on which to store their lime. So rapidly has it accumulated that last July I observed there was room for little more. That in itself was bad enough; but worse has happened in the complaint that the County Council makes, of the water supply of a village being contaminated by it. There are many hundreds of tons of lime stored there; and if the County Council succeed in establishing a nuisance, it will be a costly affair to remove it. The sale seems to be a stiff proceeding. Probably it has not been pushed; but now that greater activity is being displayed, the inconvenience of rapidly growing stocks of what is practically refuse, may be reduced. I am afraid the farmers in this part of the country do not care for gas lime. Lime in its pure state is plentiful, and I suppose cheap; and there may be a prejudice against that which has been used in gas-works. I am not aware whether any of the Commissioners are cultivators of land to any extent; but if they are, they might take the initiative in introducing its use. With farmers an ounce of practice is worth a pound of precept; and if a beginning were once made, the disposal of spent lime might not be such a serious affair in future as it has been.

The last return of the Glasgow Stove-Hiring Department shows that there were about 9370 gas-stoves and range-fittings on hire; and that the stoves, fires, and other gas-heating appliances that had been sold to date, numbered about 12,000.

Even though the price of gas in Glasgow still remains at 2s. 6d. per 1000 cubic feet, the revenue in the shape of gas-rents continues to mount up by leaps and bounds. On the 27th of January the collection of gas-rents for the financial year commencing June 1, 1891, stood at rather over £170,000; whereas at the same time last year, it was almost £141,460, thus showing an increase of nearly £28,600.

I understand that some important extensions of the retort-house and coal-store at the Dawsholm gas-works have recently been suggested and designed by Mr. Foulis, the Engineer-in-Chief, and have been approved of by the Sub-Committee on Works. Mr. Foulis has been instructed to take the necessary steps for obtaining tenders for the execution of the proposed work.

The annual meeting of the shareholders of the Coatbridge Gas Company was held last Tuesday, when, on the recommendation of the Directors, the maximum dividends of 10 and 7 per cent. on the old and new stocks respectively were agreed to. In their report and statement of accounts for the half year ending Dec. 31, 1891, the Directors stated that the total income had been £8103; and that the profits amounted to £1789, which, with the balance of £1638 brought from the preceding half year, made the sum of £3427 applicable to dividends. In consequence of continued subsidences through mining operations in the Calder district, the unaccounted-for gas during the half year was exceptionally heavy—being at the rate of 17 per cent. The average illuminating power of the gas sent out from the works was 26 standard candles. During the past half year the works were extended at an outlay of £730; and 85 meters were supplied to new

properties at a cost of £117—both of which sums were charged to works account. The repairs over the period embraced in the report were very heavy, owing to the renewal of the ironwork of the old retort-bench. The half-year's sales of gas amounted to 34,522,000 cubic feet, which, at 3s. 9d. per 1000 feet, yielded £6472. For the public lighting, there was obtained £309; and for meter and stove rents, £220. The sales of sulphate of ammonia (less cost of manufacture) yielded £335; and the revenue from tar, naphtha, &c. (less cost of distillation), was £504. Coke realized £155. The rents and various other items brought up the total to £8103. On gas coal and shale used, there was expended £2758; while the cost of the lime and oxide of iron used was £141. For repairs of works, mains, meters, &c., the expenditure was £1598, and that for salaries and wages was £1267; while the Directors' and Auditors' fees amounted to £78. Railway dues and cartage, taxes, interest, general charges, &c., brought up the total expenditure to £6313. The liabilities are set down at £58,594; and the assets, at £50,446.

It is frequently said that modesty has gone out of fashion in these days. Judging by a couple of applications which have been made to the Dundee Gas Commissioners, it would appear that it is not only unfashionable but that it is unprofitable as well. The Glasgow Alum and Ammonia Company, Limited, and Messrs. John Dobbie, Sons, and Co., of Leith, the contractors for the residual products of the gas-works, have made application for a reduction in the prices which they have contracted to pay during the current year. The Alum and Ammonia Company regret exceedingly the necessity for their communicating with the Commissioners on the subject. With a drop of 10 or 12 per cent., they say they would have continued to carry out their obligations; but the fall in prices has been unprecedented and ruinous, amounting to about 45 per cent. Crude naphtha, when they entered upon the contract, was 1s. 3d., and it is now only 8d. per gallon; and pitch oil has fallen in price from 2¼d. to 1d. per gallon. In April last, when the contract was being negotiated, they suggested the mutual advantage of a sliding scale for the residuals; but it was not acted upon. They point out, too, that in Edinburgh and Glasgow the sliding scale was adopted when the contracts were last renewed. They expressed the hope that the Gas Commissioners would see their way to give some concession, and to adopt the sliding scale as from Jan. 1 last. This the Finance Committee of the Gas Commissioners have refused to do; and they have passed a resolution that they adhere to their contract. The application of Messrs. Dobbie, who are contractors for the naphtha, is on a different footing. They say that the result has fallen short of what was represented to them, when they were making inquiries previous to tendering, by £1500; and that had the return of naphtha been anticipated as it has turned out, they could only have offered 2s. 9d. instead of 3s. 6d. for the contract—which would have been £1820 less upon the whole contract than they have to pay. This letter has been placed in the hands of the Conveners of the Finance and Works Committees, with powers. There would appear to be some reason in Messrs. Dobbie's application; but in that of the Alum and Ammonia Company, there is none whatever. They have made their bed, and must lie upon it. Suppose the price of their products had risen 45 per cent., would they have consented to augment the price they had agreed to pay to the Commissioners? I fancy not; and the Gas Commissioners should not give any concession where they have no reason to expect that they would have got one. The sliding scale would, of course, prevent either party suffering disadvantage by the rise or fall of the market; but it has not been adopted in Dundee yet, and until it has been by both parties, it cannot be held to apply to one of them.

The piping times which owners of gas coals are experiencing, is well illustrated by the position of the Rosewell Gas Coal Company—a Fifeshire undertaking, which has its headquarters in Edinburgh. The annual meeting of the shareholders was held on Tuesday; and the dividend declared was at the rate of 10 per cent. per annum, with another 10 per cent. of bonus. According to the Chairman, the present output of the Company realizes about £200 per day, about half of which is profit. It is sometimes possible to divulge too much; and in this instance, I think that was certainly done, for most commercial people will agree that a profit of 50 per cent. upon the earnings of a business indicates an unfair distribution of the gains.

One of the anomalies attendant upon the present system of assessing public works cropped up in the Finance Committee of the Dundee Water Commission on Thursday, when claims were intimated by the heritors of the parish of Newtyle upon the Commissioners for £20 19s. 5d., and by the heritors of the parish of Meigh for £8 8s. 5d., as the Commissioners' share of the costs of repairing the parish churches. Both parishes are purely rural. Neither of them is within ten miles of Dundee; and in neither of them do the Dundee Water Commissioners earn any revenue. The imposition, as I would call it, is made on the ground that the Commissioners' main-pipe from Lintrathen to Dundee passes through the parishes. The Clerk to the Commissioners stated his opinion that they were not liable; and he was instructed to reply to the claimants, denying liability.

South Staffordshire Water-Works Company.—At the meeting of the Directors of this Company, last Thursday, it was resolved (subject to the examination of the accounts by the Auditors) to recommend to the proprietors the declaration of a dividend for the half year ending Dec. 31 last, on the ordinary stock at the rate of 5½ per cent. per annum, less income-tax. This will leave a balance to be carried forward amounting to £3531, after appropriating a further sum of £1000 for the depreciation fund, which now stands at £5186.

Accident at the Wolverhampton Gas-Works.—Shortly after eleven o'clock last Thursday night an alarm was occasioned at the Stafford Road Gas-Works, Wolverhampton, by the bursting of a main. At the time of the occurrence, the retorts were being drawn; and the gas immediately ignited, causing a tremendous sheet of fire. The workmen, fearing an explosion, rushed out of the works into the street; and the alarm became so great that the inhabitants in the vicinity were afraid to go to bed. After the flames had somewhat subsided, the men again resumed work, and put out the retorts which were in close proximity to the damaged main.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 30.

Sulphate of Ammonia.—Notwithstanding reports to the contrary, the market remains perfectly steady; and it is certainly an undisputed fact that every parcel offering has been rapidly bought up, by either consumer or speculator. Hull quotations remain at £10 12s. 6d.; at Leith, business has been done at £10 11s. 3d.; Liverpool quotations are a little lower for ordinary quality (£10 10s.); but superior high-testing makes have realized extreme prices, being required for Colonial orders. A habit has grown up to predict at the close of each month lower prices for the succeeding month. But it has been seen that this statement is rarely reasonably supported, nor does this prophecy always prove true; and an unprejudiced spectator must certainly take a contrary view at the present moment, as there seems barely enough sulphate, as far as the country generally is concerned, to supply the demand, and very heavy shipments continue to be made. With a continuance of the present mild weather, the demand will set in more sharply presently; and it may therefore be expected that prices will harden before we get very far into February. Nitrate is firm; but last week's prices can hardly be realized. It can be bought on spot at 9s. 6d. per ton.

LONDON, *Jan.* 30.

Tar Products.—Values continue much the same as last week, although in benzol there is a better feeling. Pitch, on the other hand, is not quite so firm. Anthracene is lifeless, with but little prospect of improvement, as buyers seem to have covered pretty well their requirements. Creosote and oils remain very dull; and, in many districts, they form now a cheaper source of fuel than coal. Prices are: Tar, 19s. Pitch, 33s. 6d. Benzol, 90 per cent. 2s. 3d.; 50 per cent., 1s. 8½d. Toluol, 1s. 4d. Solvent naphtha, 1s. 2d. Crude benzol naphtha, 30 per cent., 11d. Creosote, 1d. Crude naphthalene, 35s. Crude carbolic, 60 s, 1s. 1½d.; Crystals, 5½d. Cresol, 8½d. Anthracene, 30 per cent. (nominal), "A" quality, 1s.; "B," quality, 8½d.

Sulphate of Ammonia is stronger, and £10 10s. to £10 12s. 6d., less 3½ per cent., is easily realizable for forward delivery. Gas liquor (10 oz.) is quoted at 6s. 9d. to 8s. 3d. per ton, according to position.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week there has been a pretty general quietening down in the demand for nearly all descriptions of fuel, especially for the better qualities, suitable for house-fire purposes; but there is still no pressure of surplus supplies upon the market, which to some extent is probably due to the restriction of the output owing to the very indifferent manner in which the miners are working at many of the pits. Prices have been steadily maintained at about late rates. For house-fire coals quotations remain firm, at 12s. 6d. for best Wigan Arley coals; 10s. 6d. to 11s., for Pemberton four feet and second qualities of Arley; and 9s. to 9s. 6d., for common house-fire coals. The lower descriptions of round coal are in fairly active demand for shipment; and good ordinary steam qualities have been readily fetching 10s. 6d. to 11s. per ton delivered at the ports on the Mersey. Inland requirements, for iron-making, steam, and general manufacturing purposes, continue only moderate, and supplies are becoming more plentiful; although quotations are not yet appreciably affected, and at the pit mouth remain at about 8s. to 8s. 6d. per ton for good qualities of steam and forge coals. The better descriptions of engine fuel still meet with a ready sale, and colliery proprietors have no difficulty in disposing of their present production. But common sorts are again beginning to hang upon the market; and though the recent improvement in prices is still being firmly maintained, there is not quite so firm a tone. At the pit mouth, burgy ranges from 6s. and 6s. 6d. for ordinary qualities, up to 7s. for some special sorts; best slack, 5s. to 5s. 6d.; medium, 4s. 3d. to 4s. 9d.; and common sorts, about 3s. 3d. to 3s. 9d. per ton.

Northern Coal Trade.—The coal trade has been very dull during the last few days; but doubt as to the future of the working at some Durham collieries is causing consumers to increase stocks of late. Northumbrian steam coals are rather slow of sale at about 10s. per ton free on board, up to 10s. 3d. Small steam coals are also extremely quiet, at from 3s. 3d. to 4s. per ton, according to quality, &c. Some of the collieries have had of late a few days' idle time; and the prices have been lowered to obtain more orders. For gas coals the demand is very good, for the reason named. The price varies from 9s. to 9s. 6d. per ton, free on board, with a very full production, which is well taken up just now. Household coals are dull and weak, owing to the lower prices ruling in the London market. For bunker coals, the inquiry is lower, and the price weaker—at from 8s. for unscreened upwards. Manufacturing coal is dull; and the demand is less on account of local strikes. For best blast-furnace coke, there is a good demand, at from 16s. up to 16s. 6d. per ton, free on board. Gas coke, however, is very dull just now; and with a large output, the consumption is lessened by strikes at cement and other works.

West of Scotland.—There is no material change to report in regard to the coal trade in the West of Scotland; the demand being about equal to the production. For forward delivery there is little business passing. Coal-masters are not seemingly disposed to meet buyers, who are holding back in anticipation of a fall in price. At current rates, however, they are willing to do business. Dross is easier; the supplies being plentiful, especially for the commoner sorts. The bulk of the trade is of a hand-to-mouth kind, at the following rates: Main, 8s.; ell, 8s. 9d. to 9s.; splint, 9s. 3d.; and steam, 10s. 6d. to 10s. 9d.—all f.o.b. Glasgow. The shipments of Scotch coal for the past week amounted to 117,996 tons, an increase of 55,218 tons over those of the corresponding week last year; but traffic at that time continued in a very dislocated state, owing to the railway servants being on strike. For the portion of the year now gone the exports amount to 318,898 tons—an increase of 127,393 over those of the same period of last year.

Electric Lighting in Liverpool.—The Liverpool Electric Supply Company, Limited, recently desired the consent of the Corporation to an application they are making for a Provisional Order, which would empower them to allow certain concessions to consumers, and more especially to enable them to reduce the prices at present charged for the electric light. Their request was supported by a very influential memorial, which was signed by the principal local firms and the representatives of the insurance and banking companies. The sublect has been fully considered by the Corporation Watch Committee, who had before them a report specially prepared by the City Engineer; and it was resolved to recommend the Council not to accede to the request, on the ground that the change was not desirable in the interests of the ratepayers.

Softening the Water Supply at St. Helens.—The St. Helens Corporation Water Committee last Tuesday week accepted the tender of Mr. J. Whittaker, of Sutton, for the buildings, and of Messrs. Woodhouse and Rawson, of Kidsgrove, for the ironwork in connection with a scheme for softening the borough water supply. The buildings and plant will be erected on land adjoining the Brownedge reservoir; and the water from Collins Green, Knowsley, and Kirkby will there be treated with lime water, for the purpose of removing the bi-carbonate of lime and iron, which at present make it hard. The water from Eccleston Hill and Whiston pumping-stations is already considered soft enough. The process to be adopted has been already sanctioned by the Council. The cost will be about £10,000; and it is expected the system will be in operation before the end of the year.

Purification of Water by Electricity.—Dr. Fermi, of Munich, has been testing Mr. Webster's method of purifying water by electricity. The dissolved organic substances are reduced about one-half, and the suspended substances are either precipitated to the bottom by the ferric hydrate formed on the surface of the iron electrodes, or gather on the surface of the water. The smell of the water is also perceptibly improved. After detailing the process and explaining the chemical action that arises during purification, Dr. Fermi says the organic substances contained in a litre of water can be reduced by two-thirds in an hour by an electric current of 0·5 to 1·9 amperes, with flat iron electrodes 80 square centimetres and 5 centimetres apart. The number of germs is thus diminished fifty or a hundred fold. The purifying effect of such current, however, is less reliable than that of the addition of 1 per cent. of lime, which completely frees the water of germs, and keeps it free; whereas in the electrified water the germs multiply again fivefold in 48 hours.

Saratov Water-Works Company, Limited.—The seventeenth annual general meeting of this Company was held last Tuesday, at the London Offices, King's Arms Yard, E.C., under the presidency of Mr. J. Morris. The Chairman proposed the adoption of the report and accounts, and said the Board were very much disappointed at the slow progress things were making in Russia, which was suffering now not only from the severe depression, but from a terrible famine. A deplorable state of things was reported by their Manager. He said the Company had great difficulty to contend with, owing to the hostility of the local authorities, whom he described as obstructive and litigious. The Directors were determined not to spend any more capital in the country, except on equitable terms; but they hoped eventually to see an improved state of things. Out of the year's revenue, the Directors proposed to pay 1½ per cent. on the ordinary shares. The £3100 of debentures were paid off in February last; and the Company were now free from debenture debt. Mr. H. Kimber, M.P., seconded the motion, and it was carried.

Water Supplies in Mexico.—One of the great drawbacks to Pachuca City has always been its insufficient water supply. The city has a population of 38,000, and yet up to the present the only available way it possesses for obtaining water is by means of an old aqueduct constructed of masonry. As a consequence, the inhabitants in the dry season have to pay 15c. for a cantaro, or 18 litres, of water. For some time past endeavours have been made to obtain a better service of water. As a result a huge reservoir dam has recently been constructed, which has a capacity of 82 million gallons. A concession for bringing this water in Pachuca was originally granted to Messrs. Napoleon Valdez and Benito Marin, who ceded their rights to Mr. R. Honey, and he constructed the reservoir at a cost of $60,000. This gentleman has recently formed a company in Mexico to carry out the scheme; and the first meeting has been held for the purposes of constituting the concern and of electing Directors. The capital is $250,000, divided into 1000 founders' shares and 4000 ordinary shares; and all have been applied for and allotted.

The Lead-Poisoning Inquiry by the Local Government Board.—Mr. W. H. Power, Dr. Barry, and Mr. T. W. Thompson, the authorities selected by the Medical Department of the Local Government Board to inquire into the question of the action of certain waters upon lead, have, since their appointment in October, 1890, collected a considerable amount of information on the subject from a large area of Yorkshire and Lancashire. This information applies to moorland waters which act upon lead, and also to similar waters not known so to act; and with this basis of procedure, a beginning is about to be made of the detailed investigation which has been contemplated by the Board. In this it is proposed "to select a number of different gathering grounds, furnishing some of them water which acts, some of them water which does not act, on lead; definite and limited areas wherein are found the two sorts of water common in moorland regions—viz., water issuing from springs in the soil, and rain-fall water accumulating in, or flowing over, or through, the peat substance—with a view to subjecting certain local circumstances of each selected area to systematic observation; and for the purpose of obtaining therefrom at regular intervals samples of the different sorts of water for testing as to differences and variations in their chemical and biological characters, and in their lead-dissolving properties." The portion quoted is an extract from a communication addressed by Mr. Power to Dr. Whitelegge, Medical Officer of the West Riding County Council, appealing for his help in the laboratory investigations that are to be made after weekly visits to the gathering-ground and the collection of samples. The County Council have, in response, voted £100 towards the laboratory expenses.

New Water-Works for Duffield.—For some months past the Duffield parish authorities have been engaged in the work of supplementing the present water supply. A spring has been procured at Handley, belonging to the Duke of Devonshire; and tenders have been sent in for constructing the reservoir, laying the mains, and the other incidental operations. The Local Committee held a meeting last Friday week, and accepted contracts amounting to £2663. The Belper Rural Sanitary Authority confirmed their proceedings on Saturday; and the work will commence forthwith. The Engineer is Mr. W. H. Radford, of Nottingham.

The Electric Fires in Liverpool.—Regarding the paragraphs which have appeared in our last two issues on this subject, it appears, from a report submitted by the City Engineer to the Health Committee of the Liverpool Corporation last Thursday, that the fires were due to imperfect insulation of the main wires near the boxes laid in the pavements by the Electric Supply Company. There are 700 of these boxes; but at only two of them has there been any accident. The City Engineer expressed his intention of conferring with the Company's Engineer, to see if some means could be taken to prevent any further mishaps.

The Water Supply of Bridgnorth.—In the course of a discussion on the water supply at the last montly meeting of the Bridgnorth Town Council, Mr. Beach drew attention to the new water scheme of the Birmingham Corporation, and pointed out that the mains from Wales would run through the district. The Corporation would be willing to supply water to the district the pipes passed through; and Worcester and Bewdley had made application for a supply. The mains would come within 10 miles of Bridgnorth; and it would cost about £5000 to construct a line of pipes to the town. Mr. Morrall suggested that a practical engineer should go over the district before considering the Birmingham scheme. He thought the charge for the supply of water by Birmingham would be permanent; while the Cridden supply after a few years would be self-supporting. Mr. Beach then proposed—"That the Town Clerk be instructed to communicate with Birmingham, Worcester, Bewdley, and Wenlock with regard to the probable cost of supplying the town with water." Mr. Morrall seconded the resolution, which, after further discussion, was carried unanimously.

Sales of Shares.—At Sheffield last Wednesday, Messrs. W. Bush and Son sold by auction 960 "D" £6 shares in the *Sheffield Gas Company*, with £1 4s. per share paid up, and a call of £1 due on the 1st inst. There were a large number of buyers present. The result of the sale was as follows: Forty of the shares sold at £6 5s. each; 90, at £6 7s. 6d.; 270, at £6 10s.; 60, at £6 12s. 6d.; 30, at £6 15s.; 30, at £6 17s.; 30, at £7 1s.; 30, at £7 4s.; 30, at £7 5s.; 90, at £7; 90, at £7 2s. 6d.; 60, at £7 1s.; 20, at £7 3s.; 14, at £7 4s.; 16, at £7; 30, at £7 2s.; and 30, at £7 1s.—the total amount realized being £6503 10s.——At a recent sale, £250 stock in the *Victoria Newmarket Gas Company, Limited*, on which the dividend last year was at the rate of 11 per cent., realized £600. The stock was put up in ten lots, all of which were secured by the Chairman of the Company (Mr. R. Stephenson).——In accordance with an announcement which appeared in the JOURNAL a few weeks since, 300 £15 new ordinary (7 per cent.) shares in the *Cirencester Gas Company, Limited*, were sold by auction by Messrs. Moore and Hill on the 18th ult.; 205 of them fetching £20 7s. 6d. each, and the remainder selling for £20 10s. each. The total amount realized by the sale was £6124 7s. 6d., for shares of the nominal value of £4500.

Claim by Messrs. Lupton and Sturgeon against the Leeds Corporation Water Committee.—At a special meeting of the Leeds Corporation Water-Works Committee last Friday, a matter of some importance and interest with regard to the Blackmoor Tunnel came up for consideration. In April of last year, Messrs. Lupton and Sturgeon wrote to the Corporation making a claim for 2½ per cent. commission on the contract price of the work of constructing the Blackmoor tunnel, for which they, in common with other engineers, submitted a scheme, which they alleged had been substantially carried out. The contract price, they understood, was £21,000; their claim consequently being for £525. On Friday, the matter again came before the Committee; a communication referring to the subject being read from Mr. E. B. Lupton, Solicitor to Messrs. Lupton and Sturgeon. It appeared that the firm were willing to have the dispute referred to arbitration; but if the Corporation would not agree to this amicable arrangement, they were prepared to support their claim by legal proceedings. The Committee decided that an acknowledgment of the receipt of the communication should be sent, and that Messrs. Lupton and Sturgeon should be informed, through their Solicitor, that the Committee declined to recognize any liability in the matter, and that they were prepared to accept service in any proceedings which Messrs. Lupton and Sturgeon might think fit to institute.

The Abergele and Rhyl Water Bills.—At the meeting of the Abergele Local Board yesterday week, the Clerk (Mr. J. W. Davies) read a communication from the Rhyl Improvement Commissioners, enclosing a resolution passed by that body in reference to the water supply of Abergele, and asking that, in consideration of certain clauses inserted in the Commissioners' Bill for ensuring a constant supply of water at constant pressure, the Board would withdraw their Bill; the Commissioners undertaking to pay all costs (not to exceed £100) already incurred in promoting it, and the Board to assist them in getting their Bill passed and to oppose that of the Rhyl Water Company. The Clerk said that, if the Rhyl Commissioners had intimated to them, before they had proceeded to take the steps they had done in introducing a Bill of their own, what they were now going to do, the Board, he could safely say, would have adopted the proposals, and not incurred the expense they had done. Immediately the Commissioners found that the Board were perfectly serious in their intention to promote a Bill of their own, they at once came to amicable arrangements; and he thought that the terms offered were very fair. Mr. Williams proposed that the Board withdraw their Bill from Parliament, and undertake to assist the Commissioners to pass their Bill. The Rev. D. Evans seconded the resolution, which was carried unanimously. It was also decided to oppose the Bill of the Water Company

Gas at the Tasmanian Exhibition.—One of Sugg's patent flat-flame shadowless lamps, developing an effective illuminating power of 700 candles, has been fixed at the entrance to the Tasmanian Exhibition at Launceston, where it is doing satisfactory duty.

Brentford Gas Company.—The Directors of this Company state that the balance to the credit of the net revenue account will enable them to recommend dividends for the past half year at the rates of 5 12½, and 9½ per cent. per annum.

The Gas Exhibition and Cookery Lectures at Sheffield.—The exhibition of gas appliances, with demonstrations in cookery, which, Messrs. Richmond and Co., Limited, of Warrington and London, lately, opened, in conjunction with the Gas Company, in the Music Hall Sheffield, has been so successful (a large number of people being unable to gain admittance) that it has been arranged to hold another exhibition the first fortnight in May. Since this exhibition was noticed last week, we learn that the number of gas-stoves out on hire in Sheffield is upwards of 1200.

Fatal Accident at the Formby Gas-Works.—At Bootle yesterday week, the Deputy County Coroner (Mr. W. T. Husband) held an inquest touching the death of Owen Donohue, who had been engaged as a labourer at the Formby Gas-Works. It appeared from the evidence that on Jan 14 deceased was employed with two other men in deepening and widening a drain which ran along a wall. They had gone about a foot below the foundation of the wall, which was built on a sandy ground, but thought there was no danger of its falling. About ten o'clock the wall fell in; and the deceased and another man named Bradshaw were so seriously injured that they had to be conveyed to the Bootle Hospital, where Donohue succumbed on the 21st ult. The jury returned a verdict of "Accidental death," expressing the opinion that there should have been some official present to see that the wall was properly supported.

Electric Lighting Questions in Belgium.—We learn from a Brussels correspondent that the question of establishing a central electric light station for the supply of the city, to which several references have been made in our columns, is likely to come before the Municipal Council shortly in something approaching a definite shape. In response to the invitations sent out a few months ago, six tenders have been submitted, and they are now under examination by the Electric Lighting Department, of which M. Wybauw, who formerly superintended the distribution of gas, is chief. This work is nearly complete; only a few particulars, which the firms tendering have been requested to furnish without delay, being needed. The idea entertained by the Administration is that the first installation of plant at the central station should be equal to the supply of 10,000 lamps in winter and 5000 in summer. In addition to these, 80 arc lamps would be required for the lighting of the Park, and 120 lamps for the boulevards. This project matures very slowly; but our correspondent says there is reason for hoping to see the capital of Belgium lighted by electricity before the end of the century. In Antwerp also there is an electric lighting scheme on foot; but it seems that the new Company who are promoting it will find some difficulty in making headway in face of the opposition they will encounter from the two Companies who now have the monopoly of the public lighting and the supply of water. The Imperial Continental Gas Association will, our correspondent says, assuredly not agree to give up any of their rights unless they are granted an extension of their concession; and this will be vigorously opposed by certain members of the Municipal Council. Instead of distributing electricity direct, which is a costly and rather difficult undertaking, M. Van Rysselberghe will send out motive power (in the shape of water), and produce the electricity at the place of consumption. This new water service could, he suggests, be utilized for industrial purposes; and it is stated that the system reduces the cost of an electric light to 3·5c. per hour—that of gas being actually 4·5c.

The Scotch Mineral Oil Companies.—A new arrangement which has been come to between the Scotch and the American Oil Companies as to the output and price of paraffin scale, has been welcomed by the shareholders of the Scotch Companies, although it means a reduction in their output of last year by 10 per cent. According to a Scotch contemporary, the capital in the Scotch oil industry is about £2,500,000 Almost the whole of the shares are held in Scotland, and a great proportion of them by small investors. The market for oil shares has always been more or less speculative, and liable at times to violent fluctuations. Since the establishment of the industry 40 years ago, quite as much money has been lost beyond recall in oil companies as is now invested in them. At first it was the production of oil for burning—the paraffin of commerce—which was the object of enterprise. When, with the flood of American petroleum, the making of burning oil ceased to be profitable in itself, it became an incident in the manufacture of various oils for machinery purposes, of sulphate of ammonia, and of paraffin wax, or "scale." The industry picked up again as these products were developed, but received another blow when American lubricating oils began to flood the kingdom and the Continent, as petroleum had already done. Relief this time was found in the increased output of sulphate of ammonia from the waste liquids. Some ten years ago this fertilizer was selling at about £20 a ton; and, on an estimated product of about 13,000 tons per annum, this meant a new source of income of about £260,000 per annum. This was an advantage which the American competitors did not possess; and it is one of the compensations which Scotch makers enjoy in distilling from shale instead of gathering in from spouting wells. But from £20, sulphate of ammonia receded, before the increasing imports of nitrate of soda and from other causes, to about £10. The Scotch Companies next found compensation in the steadily-growing demand for solid paraffin. The entire consumption of Europe five years ago was 35,000 tons; and last year it increased to 52,300 tons. Of this quantity, Scotland provided about one-half—say, 25,000 tons; and it is upon this product that the existence of the industry now practically depends. Under the new arrangement, this output is to be reduced by 10 per cent.; and the Standard Oil Company are to send an additional 5600 tons this year to the Continent. As the American production of scale is expected to increase very largely, the difficulty will necessarily arise again at some future date.

Fatal Accident at the South Shields Gas-Works.—A sad acciden occurred at the Jarrow Gas-Works last Saturday. A man attempted to pass between two shafts of cranes while they were running, and was caught by the loose jacket he was wearing, and killed on the spot; being dreadfully torn and mangled. A Coroner's inquest was held yesterday, when a verdict of "Accidental death" was returned.

Barcelona (Besos) Water-Works Company.—A Company under this title has been registered with a capital of £100,000, in £20 shares, to acquire the undertaking of the Spanish Company known as the Compania General Anonima de Aguas de Barcelona ladera derecha del Besos, with all its rights and privileges; to extend and complete the water and irrigation works, and to maintain and work them; and generally to carry on all the business of a water-works, land drainage, and irrigation company, either in the City of Barcelona or the adjacent country.

The Quality of the Metropolitan Water Supply in December.—Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner for the Metropolis (General A. de Courcy Scott) on the quality of the water supplied by the London Water Companies during the month of December last, as shown by samples taken daily for analysis, say: "Of the 166 samples examined, 160 were found to be clear, bright, and efficiently filtered. Four were recorded as slightly turbid; two as very slightly turbid. Although the generally turbid and flooded condition of the rivers throughout November was appreciably exceeded during the following month by reason of the heavy rainfall, the state of the December water supply showed upon the whole a distinct improvement. Thus, taking the Thames-derived supply for comparison, the mean degree of colour-tint was found to be reduced from 22·1 : 20 to 18·7 : 20; the mean amount of oxygen expended in oxidation, from 0·101 grain per gallon to 0·079 grain; the mean amount of organic carbon, from 0·250 to 0·240 part in 100,000 parts; and the maximum amount of organic carbon in any single sample examined, from 0·391 part to 0·319 part. Similarly, in the case of the New River and East London Companies' supplies for the two months respectively, the results obtained during December showed a similar improvement over those recorded in our previous month's report."

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 193.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c	10	11½–12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	12–14	..	11 8 6
200,000	5	12 Nov.	7½	Bombay, Limited	5	6½–7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4½–5½	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated . .	100	210–220	..	5 11 4
125,000	,,	,,	9½	Do. New	100	157–162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original .	20	40–42	..	5 9 6
888,500	Stck.	16 Sept.	5	Bristol.	100	98–103	..	4 17 1
320,000	20	15 Oct.	11½	British.	20	43–45	+1	5 0 0
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c. .	10	18–20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c. .	10	13–15	..	5 13 4
328,750	10	—	—	Buenos Ayres (New) Limited	10	5½–6½	–½	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb. .	100	93–96	..	6 5 0
150,000	20	13 Aug.	8	Cagliari, Limited	20	25–27	..	5 18 6
550,000	Stck.	15 Oct.	13¾	Commercial, Old Stock . .	100	240–250	..	5 10 0
165,000	,,	,,	10¾	Do. New do. . . .	100	190–195	..	5 10 3
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	117–122	..	3 13 9
800,000	Stck.	30 Dec.	13	Continental Union, Limited .	100	225–230	+2½	5 13 0
200,000	,,	,,	10	Do. 7 p. c. Pref .	100	185–195	..	5 2 7
75,000	Stck.	16 Sept	10	Crystal Palace District . .	100	190–200	..	5 0 0
486,090	10	29 Jan.	10	European, Limited	10	19–20*	+1	5 0 0
354,660	10	,,	10	Do. Partly paid	7½	14–15*	+¾	5 0 0
5,470,820	Stck.	13 Aug.	12†	Gaslight & Coke, A, Ordinary	100	219–224	+3	5 7 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95–98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	248–253	..	3 19 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf. .	100	118–123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do. .	100	172–177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max .	100	152–157	..	4 9 2
463,000	,,	,,	10	Do. J, 10 p. c. Prf. .	100	245–250	..	4 0 0
476,000	,,	,,	—	Do. K, 6 p. c. Prf. .	100	147–152	..	3 18 11
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	110–114	..	3 10 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	118–123	..	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	160–165	..	3 12 9
3,800,000	Stck.	12 Nov.	12	Imperial Continental . . .	100	223–228	–1	5 5 3
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4–4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109–111	..	4 10 1
541,920	20	27 Nov.	6½	Monte Video, Limited. . .	20	15–16	..	8 2 6
150,000	5	27 Nov.	10	Oriental, Limited	5	8½–9	..	5 11 1
60,000	5	30 Sept.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited.	10	2½–3½	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.. . . .	100	98–102	..	5 17 8
500,000	100	1 Dec.	6	2nd Do. . . .	100	98–102	..	5 17 8
150,000	10	15 Oct.	10	San Paulo, Limited . . .	10	10–11	..	9 1 10
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	270–275	+2½	5 12 9
1,350,000	,,	,,	12	Do. B do. .	100	222–227	..	5 5 8
200,000	,,	,,	13	Do. C do. .	100	235–240	+2½	5 8 4
700,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk. .	100	138–143	..	3 10 0
600,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,331	Stck.	30 Dec.	10	Chelsea, Ordinary	100	256–261	–4	3 16 7
1,720,560	Stck.	15 Oct.	8	East London, Ordinary . .	100	204–209	–2	3 16 7
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk. .	100	136–140	..	3 4 3
700,000	50	11 Dec.	8	Grand Junction	50	101–106	..	3 15 6
708,000	Stck.	13 Aug	10½	Kent	100	268–273	..	3 16 11
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max. . .	100	225–235	..	4 0 10
406,200	100	,,	7½	Do. 7½ p. c. max. . .	100	189–194	..	3 17 4
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk..	100	120–123	..	3 5 0
500,000	100	13 Aug.	12½	New River, New Shares . .	100	335–345	..	3 10 4
1,000,000	Stck.	29 Jan.	4	Do. 4 p. c. Deb. Stk .	100	123–126†	+½	3 3 6
902,300	Stck.	30 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	147–152	–2	4 5 6
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	140–145	..	4 9 8
1,155,066	Stck.	11 Dec.	10	West Middlesex.	100	245–255	..	3 18 5

*Ex div.

† Next dividend will be at this rate.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

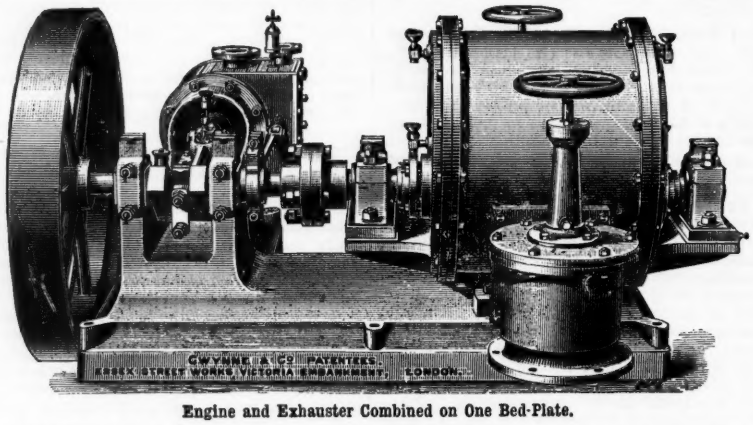
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

WINKELMANN'S "Volcanic" Fire CEMENT. (Fire resistance, 4500° Fahr.)
Prices, particulars, and directions for use on application to ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
LUX'S Gas Regulators for every consumption.
LUX'S single-stem Pressure-Gauges.
LUX'S Regulator for Gas-Engines.
LUX'S Gas-Balance.
LUX'S new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

LIQUOR and Tar wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
, See Advertisement p. 222 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes, &c.
JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Wet and Dry Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Lead Saturators, Tanks, &c., Tools and Sundries.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 224.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Acerington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID.

HUGH WALLACE & CO., Chemical Manufacturers (the old-established firm), supply the above, which is specially adapted for making White Sulphate of Ammonia. The latter purchased in any quantity at highest market prices, or contracts for the year.
For prices and terms apply Botolph House, Eastcheap, LONDON, EC.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. FEATHERSTONE 173, Fentiman Road, LONDON, S.W.

NOW READY. PRICE ONE GUINEA.

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS.

1879-1890.

Compiled by EDMUND HERBERT STEVENSON, M. Inst. C. E., F. S. I., and EDWARD KYNASTON BURSTAL, M. Inst. C. E., M. Inst. Mech. E.

This Work (which is a continuation of that published in 1879 by the late Mr. G. W. Stevenson) contains information as to the practice of Parliament during the past twelve years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings. The greatest care has been taken in its compilation; and it is arranged in a very handy form.

, The Work by the late Mr. G. W. Stevenson is still on sale, price One Guinea.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

MESSRS. DEBENHAM, TEWSON ARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

EASINGWOLD GASLIGHT AND COKE COMPANY, LIMITED.

MAKERS of Tools and all kinds of Apparatus used in Gas-Works are requested to send COPY of ILLUSTRATED PRICE LISTS for filing to Mr. F. E. ROOKLEDGE, Honorary Secretary, Easingwold, YORKS.

WANTED, by a Firm of Engineers, a REPRESENTATIVE, with a knowledge of Gas Plant.
Address No. 2065, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

LOUGHBOROUGH GAS COMPANY.

WANTED, a good Gas-Fitter (not for internal Work). One who can read the states of Meters, and who has been accustomed to lay Mains and Services, and do sundry Fittings on a Gas-Works. State Wages.
Apply to J. B. BALL, C.E., Manager.

WORKS FOREMAN.

WANTED, for a Works making 80 millions per annum, a thoroughly competent Man as WORKS FOREMAN, to be capable of taking the entire supervision in the absence of the Engineer. Must be a strictly temperate man, and have had practical experience in the working of Regenerative Furnaces, Exhausters, &c., and understand the testing of Gas for Impurities. Good Mechanic. Wages, 35s. per week, with good House, &c., &c.
Foremen of over Six years' experience, apply, by letter, with recent testimonials, to No. 2062, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKING MANAGER WANTED.

THE Directors of the Wirksworth Gas Company (making 5 million cubic feet per annum) require the services of a WORKING MANAGER. He will have to take entire charge of the Works, take Indices of Meters, and fix Meters, Lamps, Services, and Mains.
Salary, £6 per month, with House, Coal, and Gas free.
Applications will be received up to the 22nd day of February. The duties commence the 1st day of April.
Apply to the Chairman of the Gas Company, Wirksworth.

B. S. JONES,
Secretary.

Jan. 25, 1892.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

OUTDOOR SUPERINTENDENT.

THE Gas Committee are prepared to receive APPLICATIONS for this appointment from persons who have had the supervision of the Main and Service laying of a large Gas Undertaking.
Applications, stating age, experience, and salary required, with three recent testimonials, addressed to the Chairman of the Gas Committee, Town Hall, Salford, must be delivered before Five o'clock p.m. on Feb. 4.
Canvassing will disqualify.

By order,
SAMUEL BROWN,
Town Clerk.

Town Hall, Salford,
Jan. 25, 1892.

SCRUBBER for Sale, in good condition.
To be removed on account of extensions.
Particulars on application to No. 2058, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE, cheap—Two Gasholders, 35 ft. diameter by 12 ft. deep. Capacity, 11,500 cubic feet each. Also various other larger sizes.
Two PURIFIERS, 24 ft. by 16 ft. by 4 ft. 6 in. deep, with Valves and Connections.
Four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep, 12-inch Centre-Valve and Connections. Also various other sizes.
WASHERS, from 500,000 to 250,000 feet per diem.
CONDENSERS, from 500,000 to 10,000 feet per diem.
EXHAUSTERS, from 120,000 to 5000 feet per hour.
STATION METERS, from 100,000 to 1500 ft. per hour.
Would erect any of the above, and make practically equal to new.
Inquiries invited for any second-hand Gas Plant.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

GAS-WORKS TO BE LET OR SOLD.

AN opportunity presents itself for a practical Man to acquire the LEASE of, or to PURCHASE a SMALL GAS-WORKS, situated within easy distance of London. The amount of coal carbonized per annum is at present only 100 tons, but an enterprising Man could soon increase this.
Address, in first instance, No. 2064, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GOVERNOR FOR SALE.

THE Great Grimsby Gas Company have FOR SALE a 14-inch GOVERNOR (Weights and Chains and Bye-pass, three 14-inch Slide-Valves), equal to new, by J. and J. Braddock. Anyone requiring a Governor of this size will do well to see this one.
Further particulars may be obtained of Mr. WM. DREWRY, Engineer.

THE Hindley Local Board are prepared to receive TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, &c.
For particulars apply to Mr. Dickinson, Gas and Water Manager.
Sealed tenders, to be sent to the undersigned not later than Feb. 15, 1892.

By order,
STEPHEN HOLT,
Clerk.

Offices: Cross Street, Hindley,
Jan. 28, 1892.

CANNEL COAL.

THE Bangor Corporation Gas Committee invite TENDERS for the supply of 150 tons of first-class CANNEL, to produce not less than 12,000 cubic feet of Gas per ton.
To be delivered by Sea or Rail as required, during the Twelve months ending June 1, 1893.
Further particulars may be obtained on application to the undersigned.
Tenders, with printed analysis, to be sent in on or before the 20th of February, 1892, to E. Smith Owen, Esq., Gas Office, Bangor.

JOHN SMITH.
Manager.

Bangor, Jan. 29, 1892.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works from the 1st day of April next to the 31st day of March, 1893, delivered into Purchaser's Tank-Wagons at the Gas-Works Siding.
Any further information may be obtained on application to the Manager of the Gas and Water Works.
Sealed tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Tar," to be delivered at the Town Clerk's Office, on or before the 9th day of February, 1892.
The highest or any tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness,
Jan. 29, 1892.

WINDSOR ROYAL GASLIGHT COMPANY.

SUPPLY OF GAS COALS.

THE Directors of the Windsor Royal Gaslight Company invite TENDERS for the supply of 6250 tons of GAS COALS, to be delivered free at the Windsor Station of the Great Western Railway, such Coals to be either of the following descriptions, viz.:—

NEW PELTON,
PELAW MAIN,
RAVENSWORTH PELAW,
HOLMSIDE,
LONDONDERRY,
EAST PONTOP.

The Coals to be delivered as follows, viz.—April, 1892, 400 tons; May, 400 tons; June, 400 tons; July, 400 tons; August, 400 tons; September, 550 tons; October, 650 tons; November, 650 tons; December, 650 tons; January, 1893, 600 tons; February, 600 tons; March, 550 tons; the same quantities for the Twelve months following, should a Two years' contract be made.
The Company to have the option of increasing the above quantities by 50 tons in any of the months at the contract price per ton for any extra quantity so required.
The Contractor to state for which of the above descriptions of Coals he tenders, and also whether he tenders for the supply for One year or Two years.
The Directors will not entertain any conditional tender, nor any tender for any other class of Coals, nor do they bind themselves to accept the lowest or any tender.
Sealed tenders to be delivered on or before Monday, the 29th day of February, 1892, addressed to the Secretary, Gas Offices, Windsor.

By order,
JOHN HENRY STRANGE,
Secretary.

Gas Offices: 15, Victoria Street,
Windsor, Berks., Feb. 2, 1892.

ISLE OF THANET GAS COMPANY.

SALE BY TENDER
OF
SIXTY NEW SHARES OF £25 EACH,

Being the second portion of Additional Capital authorized to be raised by Resolutions passed at a Special General Meeting of Proprietors held on the 16th of September, 1887, in pursuance of the powers of the Thanet Gas Act, 1877.

THE Directors of the Isle of Thanet Gas Company give notice that they will be prepared to receive, not later than Ten o'clock a.m., on Friday, the 26th of February, 1892, sealed TENDERS for 60 SHARES of £25 each.
The Capital now offered is required for the extension and enlargement of the Company's Works, to enable them to meet the increased demands for Gas.
The existing Paid-up Capital is as follows:—
£36,000 Margate Consolidated Stock,
100 new £25 Shares fully called up,
£7000 Debenture Stock, 5 per cent. per annum.
The Consolidated Stock and the New Shares to be issued are entitled to a Dividend of 7 per cent., to be increased or diminished 5s. per cent. for every penny charged in diminution or excess of the standard price of Gas—viz., 4s. 2d. per 1000 cubic feet.
The Dividend on the Consolidated Stocks for the last Twelve months was at the rate of 10 per cent. per annum; and the price of Gas, 3s. per 1000 feet.
Forms of Tender and full particulars can be obtained at the Gas-Works, Margate, or will be sent by post on application.
No tender will be received after Ten a.m., on Friday, Feb. 26, 1892.

By order,
THOMAS C. FULLER, Secretary.

BOROUGH OF WEST BROMWICH.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the construction of a BRICK GASHOLDER TANK, 124 feet diameter, at their Gas-Works, Albion, West Bromwich.
Drawings and Specifications may be seen, and all information obtained, upon application to the Manager (Mr. Littlewood), at the Works, as above.
Tenders, properly endorsed, to be sent to me at the Town Hall, West Bromwich, not later than Thursday, the 11th prox.
The Gas Committee do not bind themselves to accept the lowest or any tender.

By order,
THOS. HUDSON,
Secretary.

Town Hall, West Bromwich.
Jan. 9, 1892.

THE Gas Committee of the Leeds Corporation solicit TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, LUMPS, and FIRE-CLAY.
Particulars as to quantity, together with Forms of Tender, may be obtained from Mr. Lupton, Gas Department, Municipal Offices, Leeds.
Tenders, addressed to the Chairman at the above address, endorsed "Tender for Fire Goods," will be received not later than Monday, the 15th of February next.
The lowest or any tender will not necessarily be accepted.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of WET and DRY GAS-METERS, to be delivered at their Gas-Works during a period of Twelve months from receipt of order.
Each party tendering is required to send, on or before Saturday, the 13th of February next, two sample Three-light Meters (one of which is to be unscrewed for examination), and also a list of guaranteed weights of Drums of all sizes, addressed to Mr. Lupton, Gas-Meter Works, Dewsbury Road, Leeds, from whom Forms of Tender may be obtained on application at the Offices of the Gas Department, Municipal Buildings, Leeds.
Endorsed tenders, addressed to the Chairman of the Gas Committee, at the latter address, will be received not later than Monday, the 15th of February next.
The Committee do not bind themselves to accept the lowest or any tender.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

NINTH YEAR. Ready to-morrow (Demy 8vo., Price 5s. 6d. post free),

THE COMPLETE REPORTS OF THE PROCEEDINGS

OF THE VARIOUS

DISTRICT ASSOCIATIONS OF GAS MANAGERS

For 1891,

Forming a Companion Volume to the Transactions of The Gas Institute, with which it is uniform in size.

*** THE VOLUMES for 1883 to 1890 ARE STILL ON SALE.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

PENRITH LOCAL BOARD.

THE Gas Committee of the Penrith Local Board are prepared to receive TENDERS for the construction and erection of a GASHOLDER and TANK and other APPARATUS at the Gas-Works, Penrith.

Plans and Specifications may be seen at the Offices of the Local Board, or on application to Mr. J. Hepworth, C.E., Gas-Works, Carlisle.

Tenders, endorsed "Tender for Extensions," must be delivered to me not later than the 8th day of February, 1892.

The lowest or any tender will not necessarily be accepted.

By order,
GEO. WAINWRIGHT,
Clerk to the Board.

Public Offices, Penrith,
Jan. 15, 1893.

MANCHESTER CORPORATION GAS-WORKS.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Manchester Corporation are prepared to receive TENDERS for the purchase and removal of the TAR and AMMONIACAL LIQUOR to be produced at their Droylsden Station during a period of one or more years from the 31st of March, 1892.

The Committee do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tar and Liquor, Droylsden," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 25th day of February next.

Forms of Tender and further particulars may be obtained on application, in writing, to Mr. Charles Nickson, Superintendent of the Gas Department.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 29, 1892.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the GAS TAR to be produced at their several Stations during a period of One, Two, or Three years, commencing as follows, viz.:—

Bradford Road Station, from noon on the 31st of March, 1892.
Rochdale Road Station, from noon on the 24th of June, 1892.
Gaythorn Station, from noon on the 1st of August 1892.

The Committee do not bind themselves to accept the highest or any tender, and reserve the right to divide the tenders as they may consider advisable.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tar," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 25th of February next.

Forms of Tender and other particulars may be obtained on application, in writing, to Mr. Charles Nickson, Superintendent of the Department.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 29, 1892.

IMPORTANT SALE OF FIVE PER CENT. GAS STOCK IN THE CARDIFF GASLIGHT AND COKE COMPANY.

INCORPORATED MAY 5, 1837.

MR. LEWIS GOTTWALTZ (of the firm of Gottwaltz and Bowring) has been instructed by the Cardiff Gaslight and Coke Company to offer for SALE BY PUBLIC AUCTION, at the Royal Hotel, Cardiff, on Saturday, the 13th of February, 1892, at Three p.m. precisely, £14,661 ORDINARY "D" STOCK in the above Company, bearing a Maximum Dividend of 5 per cent. per annum, pursuant to the Cardiff Gas Act, 1887.

The Stock will be offered in lots of the nominal amount of £100 each, and will, on payment in full of the purchase-money, be issued to each purchaser free of all expense.

The amount required at this Sale being restricted to £14,661, including Premiums, the Auctioneer will close the Sale as soon as this amount has been obtained.

NOTE.—The Purchaser of any Lot will have the option of taking any of the next four following Lots at the same price.

Particulars and Conditions of Sale may be obtained of Messrs. SPENCER, CORBETT, AND EVANS, Solicitors, Working Street, CARDIFF; Mr. LEWIS GOTTWALTZ, the Auctioneer, High Street, CARDIFF; and of the undersigned.

GEORGE CLARRY,
Secretary.

Gas Offices: Bute Terrace, Cardiff.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Guildhall Tavern, Gresham Street, in the City of London, on Friday, the 26th day of February, 1892, at Half-past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect Directors and an Auditor, and to transact the general business of the Company.

The Transfer Books will be closed from the 13th to the 26th of February, both inclusive.

By order of the Board,
ALFRED LASS,
Secretary.

Offices: 30, Gracechurch Street,
London, Jan. 29, 1892.

RE W. G. KENT, ESQ., DECEASED, AND OTHERS.

GAS SHARES IN THE:
West Ham Gas Company,
Crystal Palace District Gas Company,
Walton-on-Thames and Weybridge Gas Company, and in the
Albo-Carbon Light Company, which will be sold by Auction by

MR. ALFRED RICHARDS, at the Mart, E.C., on Tuesday, Feb. 9, at One, in lots.

Particulars of Messrs. HORSLEY AND WEIGHTMAN, Solicitors, 1, GUILDHALL CHAMBERS, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Bridge House Hotel, London Bridge, in the Borough of Southwark, on Wednesday, the 17th day of February next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ending the 31st of December last, to declare a Dividend, and to elect two Directors and one Auditor in the place of those retiring by rotation.

The Transfer Books will be closed from the 3rd day of February until after the meeting.

By order,
FRANK BUSH, Secretary.

Offices: 709A, Old Kent Road, S.E.,
Jan. 25, 1892.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

Now Ready, the 1891 *issues of the*

GAS & WATER Cos.' DIRECTORY, 5/-
GAS-WORKS STATISTICS, 3/6.
WATER-WORKS STATISTICS, 2/6.

OR

COMPLETE IN ONE VOLUME, 10/-.

PROSPECTUS AND SPECIMEN PAGES FREE.

London: HAZELL, WATSON, & VINEY, Ltd.,
1, CREED LANE, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.

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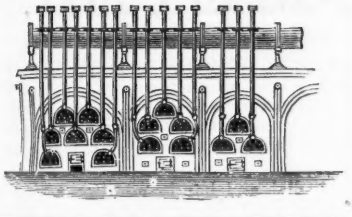

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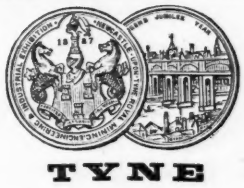

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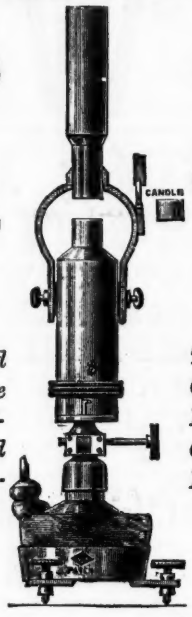

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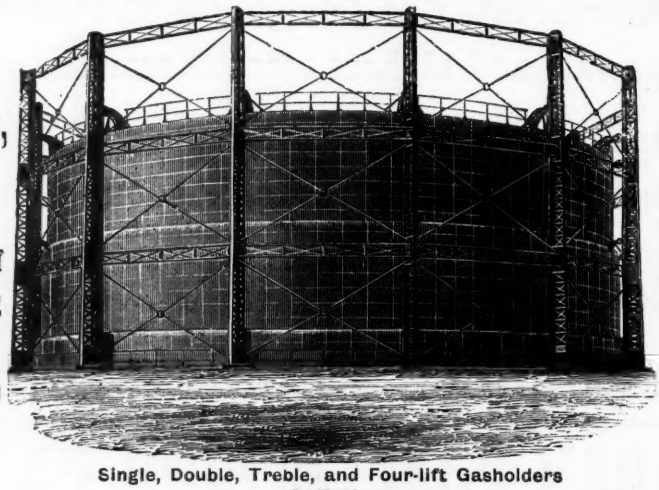

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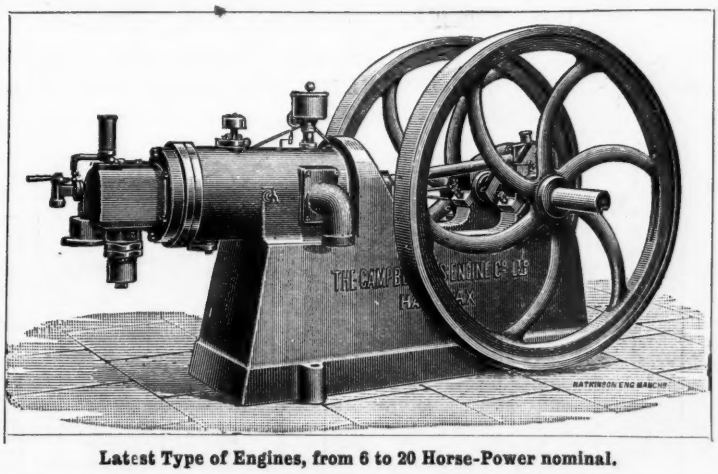

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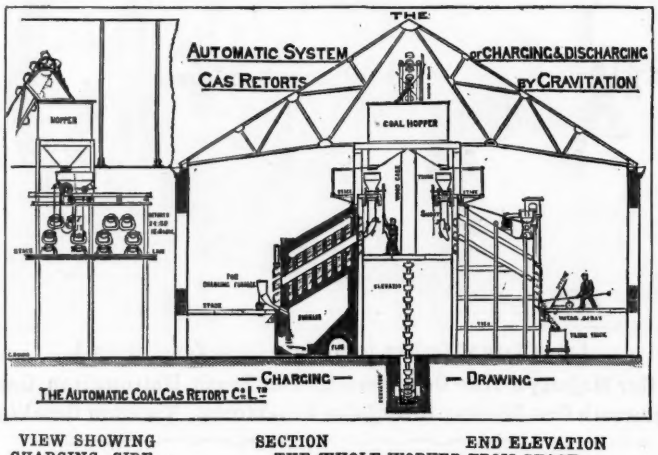

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Advantages-

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RETORTS 24 in. X 15 in. D's 15 FEET LONG. SIX IN A BED.
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With Curved Front Fire.

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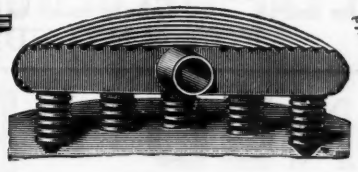
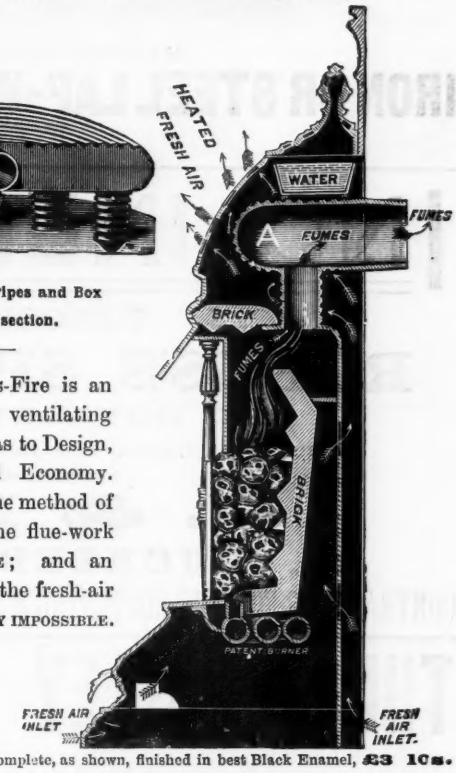


Corrugated Flue-Pipes and Box marked A in section.

This Patent Gas-Fire is an improvement on any ventilating Stove yet introduced as to Design, Heating Power, and Economy. The drawings show the method of construction. All the flue-work is CAST IN ONE PIECE; and an escape of Fumes into the fresh-air chamber is ABSOLUTELY IMPOSSIBLE.



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Boiling-Burner fitted at top, extra, **17s.**
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See also Advt., p. 190.]

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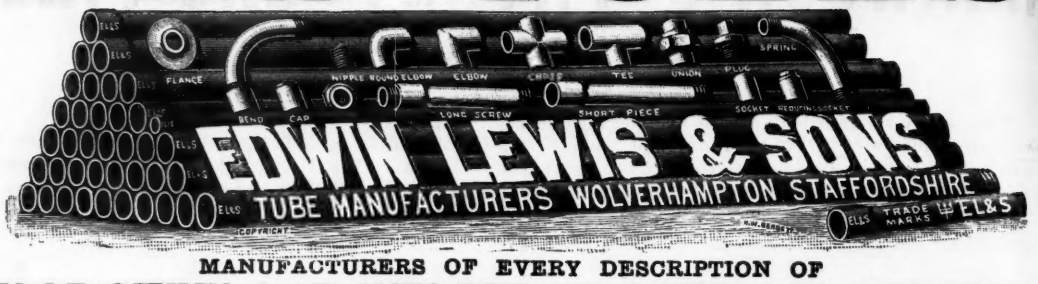

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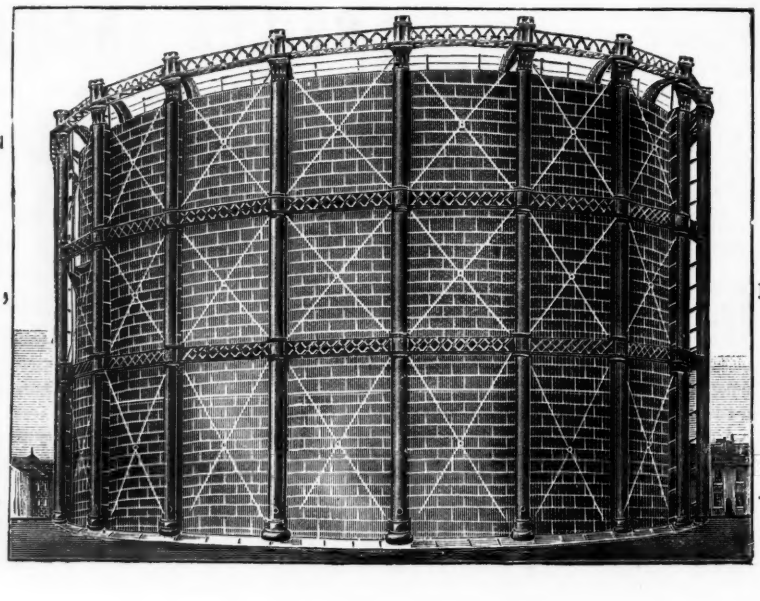

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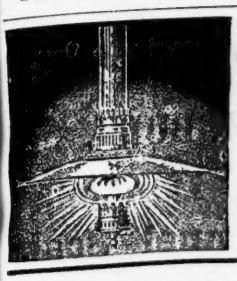

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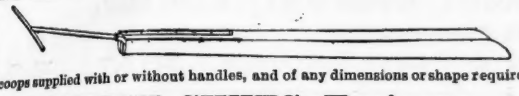

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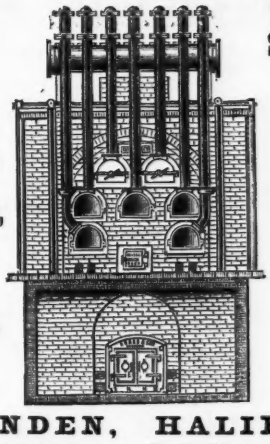

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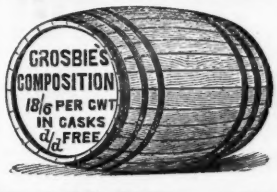

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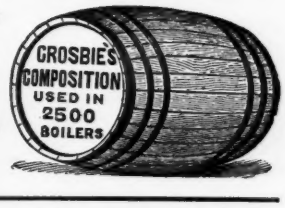

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Total of Fast Tests . .	47·2 ...	6·9 ...	33·6 ...	62·3 ...	53·7
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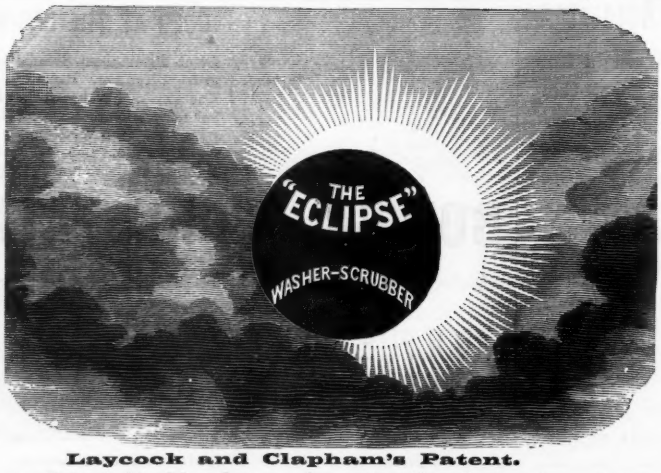

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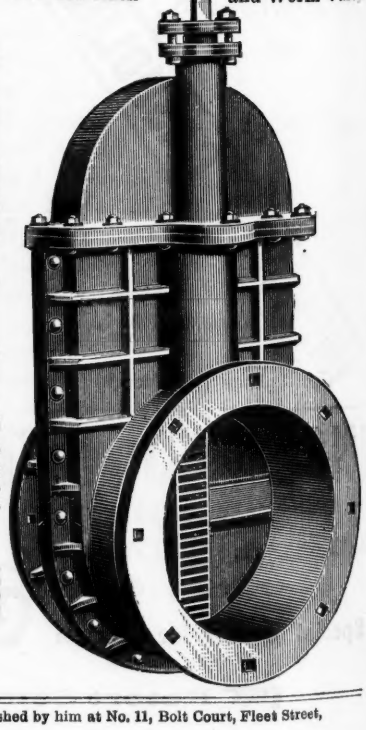

SILVER MEDAL, Inventions Exhibition, 1885.

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